IMUGENE
Developing Cancer Immunotherapies

AN EMERGING LEADER IN CANCER IMMUNO-ONCOLOGY

Investor Presentation

May 2019

NOTICE: FORWARD LOOKING STATEMENTS

Any forward looking statements in this presentation have been prepared on the basis of a number of assumptions which may prove incorrect and the current intentions, plans, expectations and beliefs about future events are subject to risks, uncertainties and other factors, many of which are outside Imugene Limited's control. Important factors that could cause actual results to differ materially from any assumptions or expectations expressed or implied in this brochure include known and unknown risks. As actual results may differ materially to any assumptions made in this brochure, you are urged to view any forward looking statements contained in this brochure with caution. This presentation should not be relied on as a recommendation or forecast by Imugene Limited, and should not be construed as either an offer to sell or a solicitation of an offer to buy or sell shares in any jurisdiction in which it would be a contravention of applicable law.

Key investment highlights

Strong preliminary results from ongoing clinical trials	• Promising Phase 1 clinical trial results across lead candidate B cell vaccines • Currently have two therapies (HER-Vaxx and B-Vaxx) in Phase 2 studies with a pipeline of other therapies and combinations undergoing earlier stage development
Robust pipeline of B cell vaccines targeting high potential areas	• Robust pipeline of novel B cell vaccines targeting large therapeutic areas • Immuno-oncology treatments are at the forefront of cancer innovation with the leading drugs[1] generating over US$23bn in 2018 • Vision to transform and improve the treatment of cancer patients
Fully funded to progress clinical program	• Company currently fully funded in supporting all clinical research programs • Focus on continuing to build awareness for the product through acceptance of abstracts and presentations at key industry conferences such as AACR • A number of key clinical and preclinical catalysts are expected in 2019
Best in class leadership team with a track record in drug development	• Experienced board and management team with successful track record developing, licensing and commercialising early stage drugs
Active market with numerous commercialisation and M&A opportunities in the sector	• Currently targeting the gastric and lung cancer market with the potential to extend beyond these indications in the future • The immuno-oncology sector has attracted intense interest from big pharma as highlighted from recent M&A and licensing deals

Notes:
1. The subset Herceptin, Perjeta, Opdivo and Keytruda

Lead by an experienced management team which have significant clinical development commercialisation expertise in the sector

Leslie Chong
SYDNEY, AU

Managing Director & CEO

- 20+ years of oncology experience across Phase I – III clinical development programs
- Ex Senior Clinical Program Lead at Genentech, one of the world's most successful biotech businesses which sold the best selling breast cancer drug Herceptin
- Also worked at global majors GSK and Exelixis

Paul Hopper
SYDNEY, AU

Executive Chairman

- Founder of Imugene
- Extensive international & ASX biotech capital markets experience particularly in immuno-oncology & vaccines
- Former Chairman of Viralytics, Founder & Director of Prescient

Dr Axel Hoos
PHILADELPHIA, USA

Non-Executive Director

- Senior Vice President and Head of Oncology at GSK
- Former Medical Lead for Yervoy, the first immuno-oncology treatment to improve first survival
- Chairman of the BoD of the Sabin Vaccine Institute
- Co-Chair of the Cancer Immunotherapy Consortium Think-Tank

Mr Charles Walker
BRISBANE, AU

Non-Executive Director

- Experienced listed biotech CEO and CFO (ASX:ACL and ASX:IMU)
- Extensive financial markets experience having executed 50+ cross border transactions
- Clinical experience includes managing pipeline of drugs in all stages from discovery, through to Phase III to product launch

Management team

Dr Lesley Russell
SYDNEY, AU

Non-Executive Director

- 25+ years of senior international operational and leadership experience having worked at Amgen, Eli Lilly, Teva, and Cephalon
- Extensive knowledge and experience with new drug development

Dr Mark Marino
CALIFORNIA, USA

Chief Medical Officer

- 28+ years of experience in drug development
- Former CMO of Cytori, Head of Clinical Pharmacology at Eisai and Roche, Head of R&D at Mannkind and VP Clinical Development at Daiichi

Dr Nick Ede
MELBOURNE, AU

Chief Technology Officer

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

Dr Anthony Good
SYDNEY, AU

Vice President of Clinical Research

- 20+ years experience in global clinical development
- Integral to the development of significant new medicines including Viagra, Revatio, Lipitor, and Somavert
- Ex Pfizer Global Research and Development, Ex Covance Clinical Services

Imugene has a team with oncology drug development experience

Imugene's Scientific Advisory Board consists of world leading oncologist, researchers and developers

Prof Pravin Kaumaya
OHIO STATE UNIVERSITY, USA

- Prof of Medicine Department of Obstetric Gynecology at Ohio State University
- Research focus in tumour immunology, mechanisms of tumour cell-immune cell interactions, and immune mechanisms
- Research focus on fields of vaccine with emphasis on peptide vaccines for cancer

Dr. Michael Galigiuri
CITY OF HOPE, USA

- President of City of Hope National Medical Center and holds the Deana and Steve Campbell Physician-in-Chief.
- Elected President of the American Association for Cancer Research (AACR) in 2017

Prof. Josep Tabernero
VALL D'HEBRON, BARCELONA, SPAIN

- President of European Society for Medical Oncology (ESMO)
- President of the Medical Oncology Department at the Vall d'Hebron
- Director of the Vall d"Hebron Institute of Oncology (VHIO)

Prof Tanios Bekail Saab
MAYO CLINIC, USA

- Professor of College of Medicine and Science
- Program Co-Leader, GI Cancer, Mayo Clinic Cancer Center
- Medical Director, Cancer Clinical Research Office (CCRO)
- Senior Associate Consultant, Mayo Clinic AZ

Prof Peter Schmid
BARTS CANCER INSTITUTE, QUEEN MARY UNIVERSITY OF LONDON

- Medical Oncologist
- Expertise in breast and lung cancer, cancer immunotherapy and early drug development
- Leads the Centre of Experimental Medicine at Barts Cancer Institute

Prof. Ursula Wiedermann-Schmidt
MEDICAL UNIVERSITY OF VIENNA, AUSTRIA

- Co-inventor of HER-Vaxx
- Professor of Vaccinology at Medical University of Vienna

Dr Neil Segal
MEMORIAL SLOAN KETTERING CANCER CENTER, USA

- Medical Oncologist
- Expertise in GI, Colon, Pancreatic cancers
- Active clinical immuno-oncology researcher
- Clinical lead in several trials using PD-L1 inhibitors

Dr Yelina Janjigian
MEMORIAL SLOAN KETTERING CANCER CENTER, USA

- Medical Oncologist
- Expertise in esophageal and stomach (gastric) cancer
- Active in GI clinical trials testing combinations of Her-2 and checkpoint inhibitor therapies

Imugene has a world renowned advisory board of scientists and oncologists

Immuno–oncology: A high-value therapeutic approach

Immuno-oncology - A rapidly growing market

- Immuno-oncology allows for a more targeted treatment
- Harnesses the patients own immune system to recognise and destroy cancer cells
- Multiple first-line treatments approved

B cell peptide vaccines provide potential benefits

- ✓ Potentially leading to a better outlook for the long term survival of patients with advanced cancers
- ✓ Has the potential to inhibit tumour recurrence with potentially less toxic side effects

A pioneer and leader in the B cell peptide cancer vaccine space

- Imugene is the market pioneer and leader in B cell peptide cancer vaccines
- Currently has the most advanced B cell peptide cancer vaccines clinical program in the industry

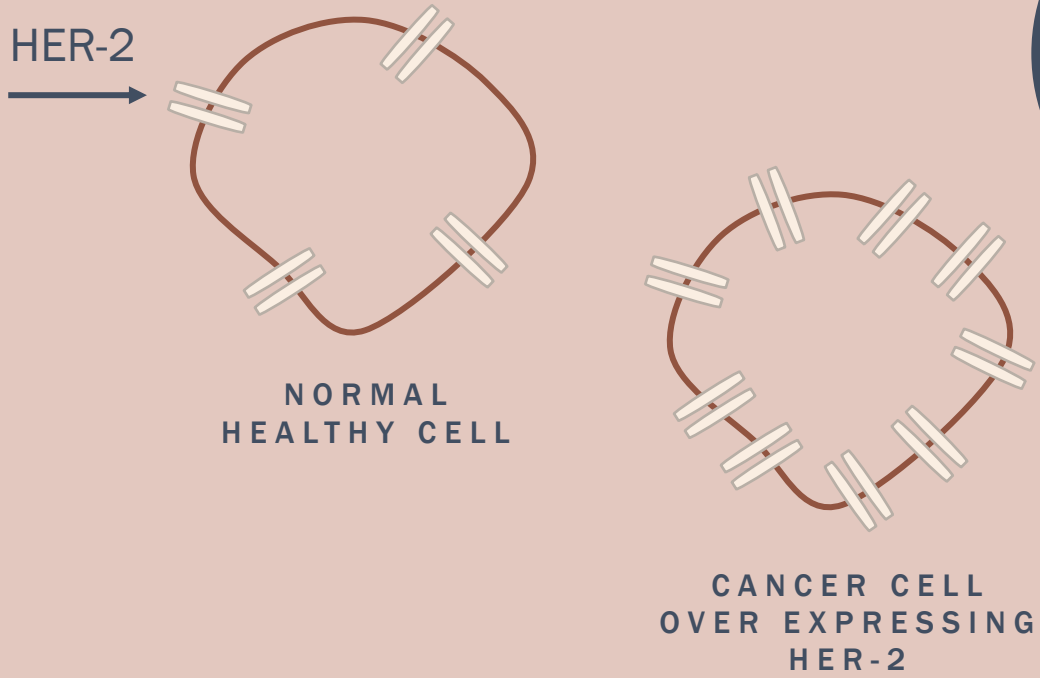
B cell based antibodies have distinct advantages to existing treatments

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.

	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 tumour 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 combination	Expensive course of treatment >US$100K per year

What is Imugene's B cell vaccine (HER-Vaxx) trying to solve?

- HER-2 (Human Epidermal Growth Factor Receptor) stimulates cancer cells to grow
- 10 - 30% of gastric, breast, ovarian and pancreatic cancer patients have tested HER-2 positive
- The incidence of increased HER-2 (known as over expression) in the body is associated with a higher chance of cancer spreading and an increased probability of cancer recurrence

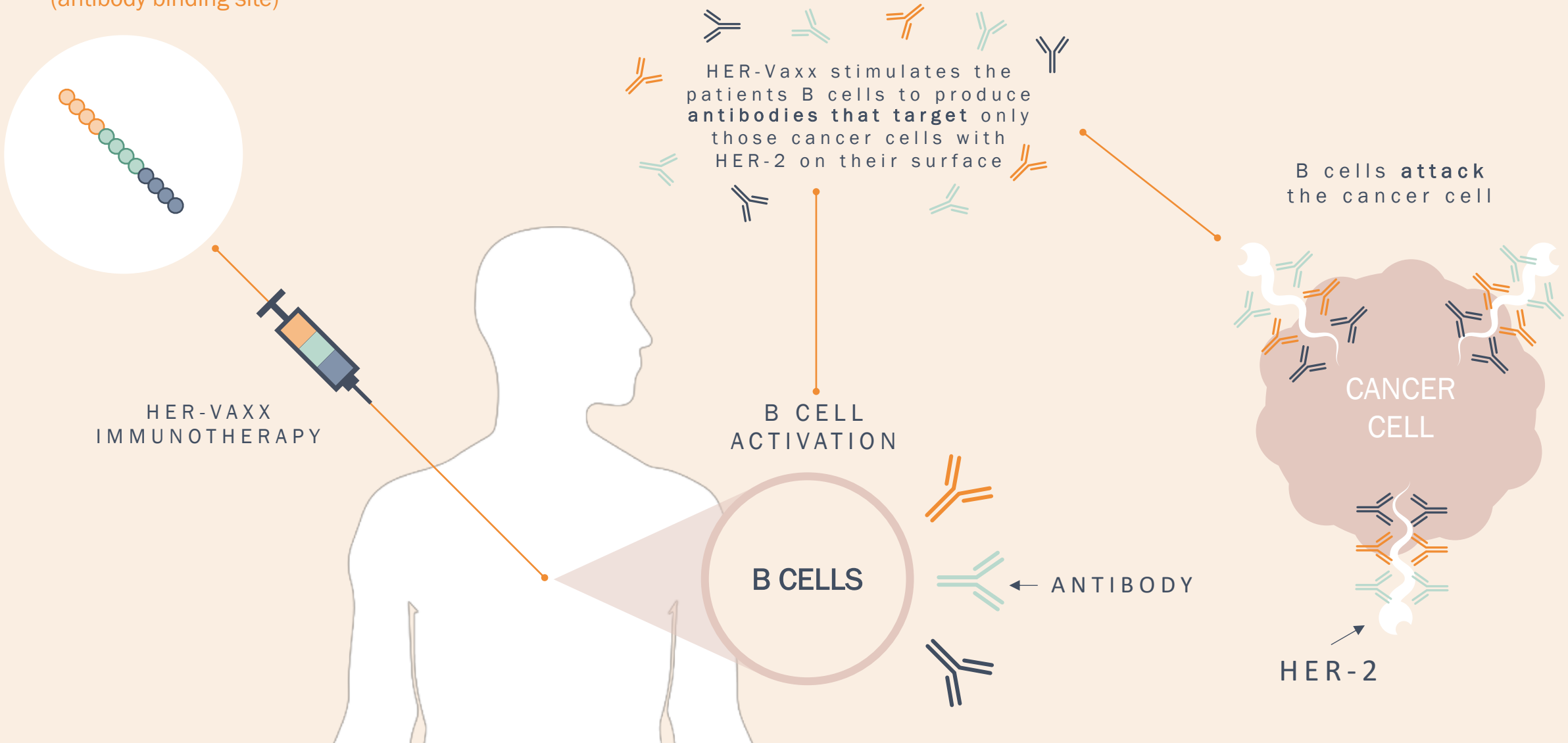


HER-2 is a clinically and commercially validated target for cancer treatment

Imugene's products have the potential to improve upon commercialised HER-2 treatments such as Herceptain and Perjeta

How does HER-Vaxx work?

3 Peptides “mimic” the epitope
(antibody binding site)

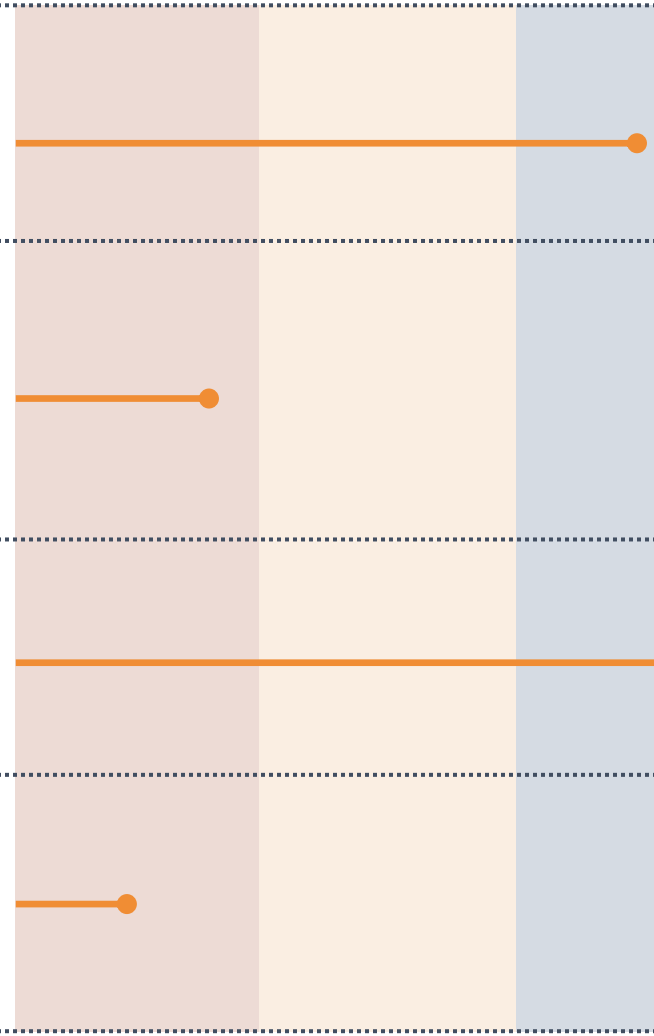


A significant market opportunity across key Imugene vaccines

		GASTRIC CANCER (HER-VAXX)	LUNG CANCER (KEY- VAXX)
Incidence	Newly diagnosed cases	1m cases per year, globally 19% relate to HER2+ cancers	1.8m cases per year, globally
Prognosis	5 year relative survival rate	< 25%	~18%
	Survival	Median survival is 7-10 months	17% chance of surviving at least 5 years
Existing treatment costs	Herceptin® trastuzumab	US$140,000 per year	n.a
	KEYTRUDA® (pembrolizumab) Injection 100 mg	n.a	US$150,000 per year
	OPDIVO® (nivolumab)	n.a	US$157,000 per year

Sources: Scientific journals, press releases and internal company findings

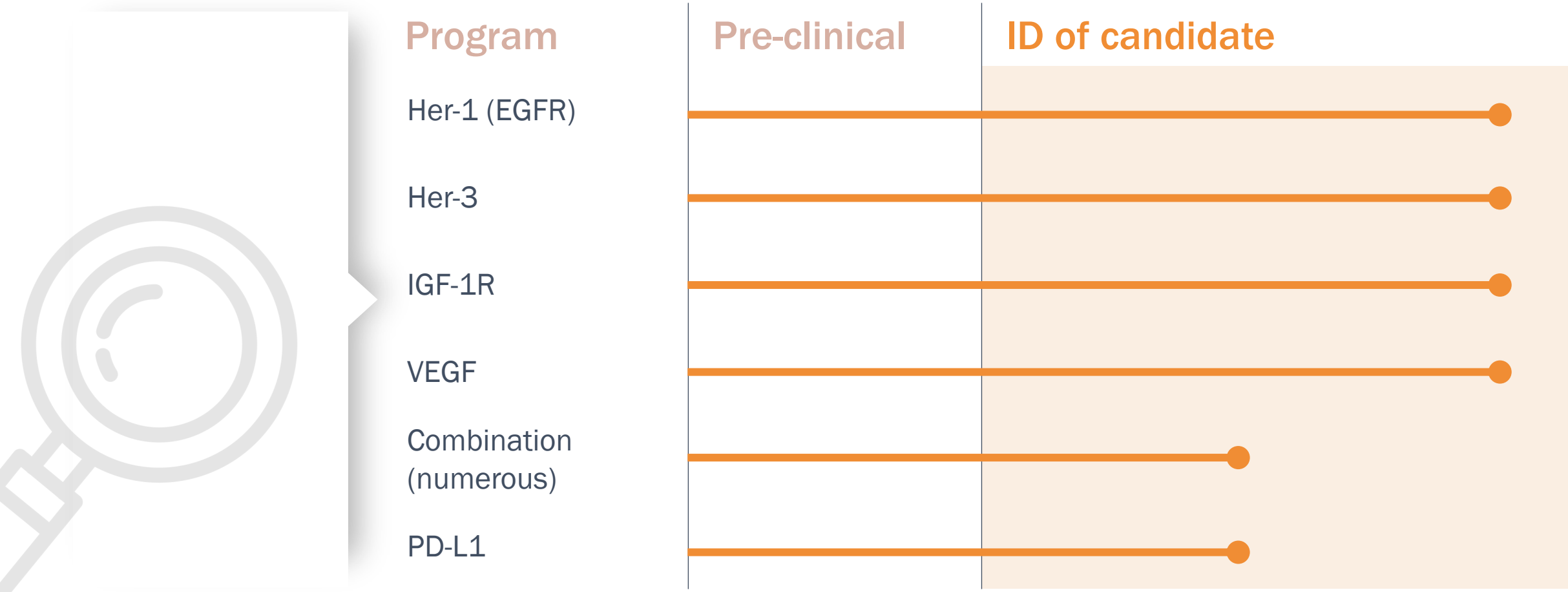
Imugene has a developing pipeline of cancer vaccines



	Key Data / Results	Key IP patents
HER-Vaxx (HER-2)	• **Successful completion** of Phase 1b trials • Strong trial results with **no safety or toxicity issues** • All patients had **increased antibody response** • **11/14** evaluable patients with encouraging clinical responses	Intellectual property patents expiring April 2027, August 2030 & April 2036
KEY-Vaxx (PD-1)	• KEY-Vaxx has shown encouraging response in preclinical studies • **Strong inhibition of tumour growth** in mouse models of colorectal cancer (outperformed industry standard mouse PD-1 mAb) • Signs of increased tumour growth inhibition when co-administered with B-Vaxx	Intellectual property patents expiring March 2037 & February 2038
B-Vaxx (HER-2)	• **Positive Phase 1 results** and now currently in phase 2 • B-Vaxx is **fully funded** by OSU grant • **14/24** evaluable late stage patients with encouraging clinical response	Intellectual property patents expiring April 2027 & August 2030
HER-2 & PD-1 Vaccine Combination	• Pre-clinical studies showed **90% cancer growth inhibition** in colorectal cancer model with the combination • **Potentially solves the industry problem** of additive toxicity of combined checkpoint inhibitors if safety of vaccines maintained in combination	

Imugene discovery pipeline

Imugene has the ability to advance these programs at any point



HER-Vaxx: Successfully completed Phase 1B study…

Phase 1b – Complete

Trial

- Phase 1b
- Open label

Patients

- Gastric Cancer
- Up to 18 patients in 3 cohorts (10, 30 and 50 µg)

Study

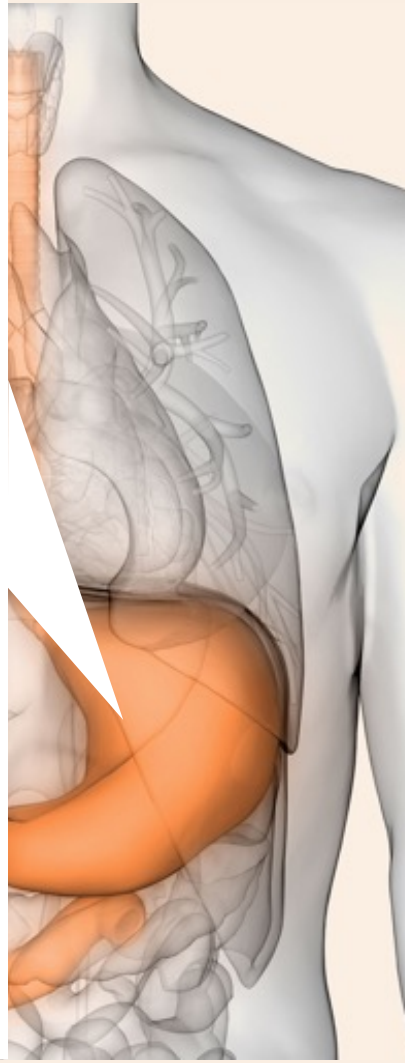
HER-Vaxx in combination with chemo: Cisplatin and 5FU or capecitabine

Endpoints

- Recommended Phase 2 Dose of HER-Vaxx
- Safety and Toxicity
- Immunogenicity (anti-HER-2 antibody titres)

Study Results

- 50 µg selected as the RP2D
- No safety or toxicity issues
- All patients had increased antibody response
- Best Response Rates
  - 1 Complete Response
  - 5 Partial Response
  - 4 Stable Disease

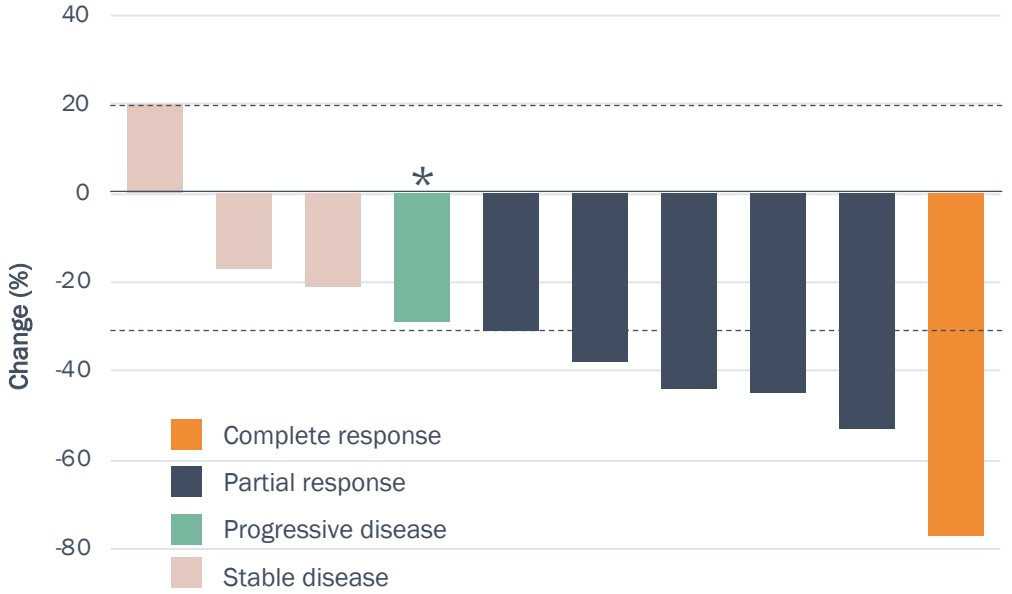


Positive results for HER-Vaxx Vaccine Phase 1b trial

Key Findings

- ✓ **11 out of 14** were evaluable for vaccine-specific immune responses and tumour response assessment
- ✓ Those patients that were dosed with **50 micrograms** showed marked **increases of HER-2 specific antibody** levels
- ✓ **2 of the 3 patients** dosed with 50 micrograms demonstrated greater than **40% reduction in tumour size from baseline** to day 56
- ✓ The vaccines were well tolerated and safe with antibody responses at the highest dose of 50 micrograms with **no significant local or systemic side effects**
- ✓ Trial showed **clear dose-dependence** of HER-2 specific antibody production

Change from baseline (%) in tumour size



RECIST definitions;

Complete response (CR)	Disappearance[1] of all target lesions
Partial response (PR)	At least 30% decrease in size of target lesions
Progressive disease (PD)	At least 20% increase in size of target lesions or the appearance of one or more new lesions: *Target lesions decrease by 30%; per RECIST PD due to 2 new lesions
Stable disease (SD)	Neither sufficient shrinkage to qualify for PR nor sufficient increase to qualify for PD

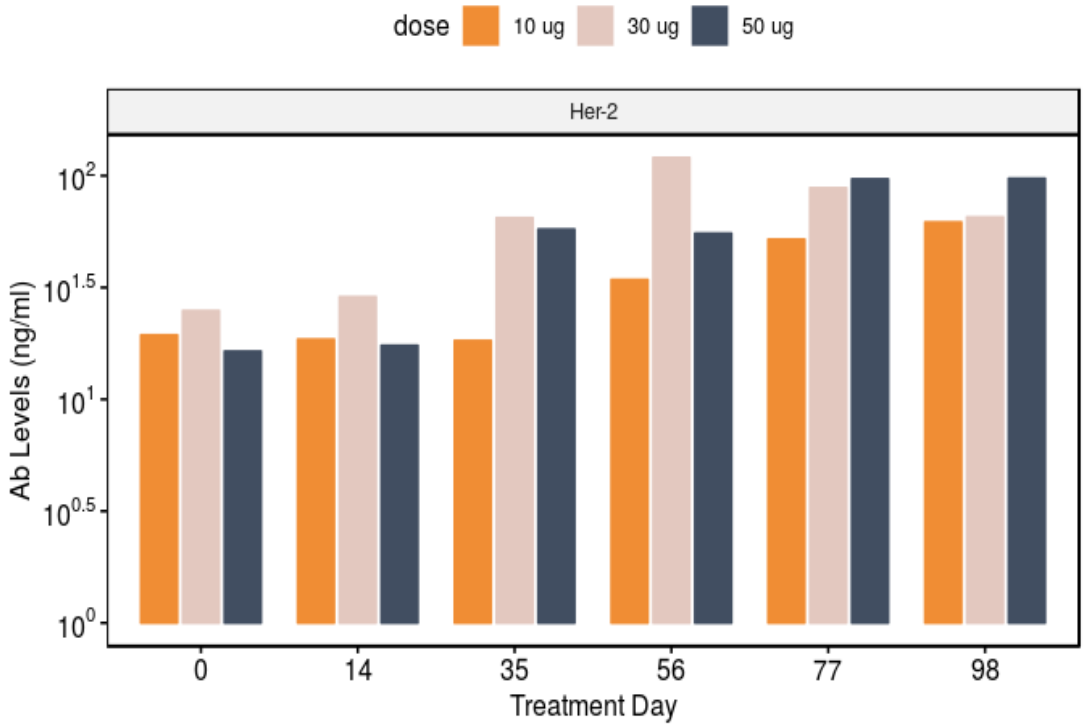
1. Defined as less than 10mm for the sum of all the target lesions

Positive results for HER-Vaxx Vaccine Phase 1b trial continued

Key Findings

- ✓ The **50 µg dose** of IMU-131 produced the **most consistent p467 specific antibodies and HER-2 specific antibodies** compared to the 10 and 30 µg doses
- ✓ All 14 patients reported adverse events with majority of the events assessed as Grade 1 to 3 severity and **not related to IMU-131**, but were consistent with those **known to occur with the concomitant chemotherapy**
- ✓ **IMU-131 was well-tolerated with no significant local or systemic reactions** and there was no need for pre-treatment or for modification to the dose or treatment schedule due to safety

HER2-specific IgG ANTIBODIEs in Cohort 1, 2, and 3 measured in sera obtained at treatment visits



...and commenced Phase 2

Phase 2 commenced - First patient dosed March 2019

Trial

- Phase 2
- Open label
- Asia
- Eastern Europe
- India

Patients

- Gastric Cancer
- Up to 70 patients

Study

Randomized
HER-Vaxx in combination with standard of care chemotherapy

Or
Standard of care chemo: Cisplatin and 5FU or capecitabine or oxaliplatin

Primary Endpoints

- Overall survival
- Progression-free survival

Secondary Endpoints

- Safety and Tolerability
- Immune response

Phase 2 designed to provide definitive data

KEY-Vaxx: A new entrant in the checkpoint inhibitor market

How PD-1 targeted treatments work

PD-1 targeted treatments block PD-L1 expressing tumour cells from binding PD-1 on T-cells (resulting in increased activation of the T cell immune response in the tumour microenvironment)

Limitations of current treatments

- Current checkpoint inhibiting monoclonal antibody therapies only effective in 10-30% of patients
- Require intravenous infusions every 2-3 weeks and has a high toxicity profile when used in combination
- Very expensive

KEY-Vaxx potentially addresses these problems

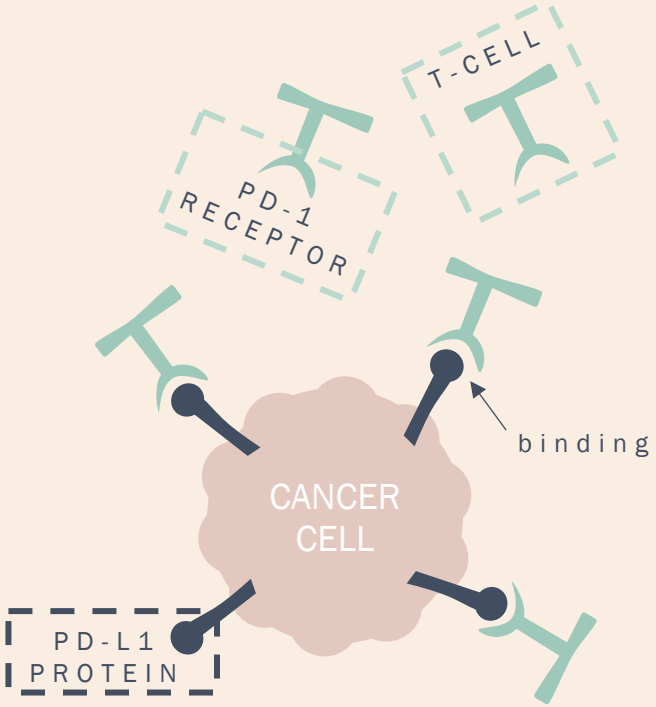
KEY-Vaxx is a PD-1 B cell vaccine, **aimed to induce the body to produce polyclonal antibodies** while existing commercialised immunotherapies **Keytruda® (Merck) and Opdivo® (BMS)** are monoclonal antibodies

Current phase:
Phase 1 (commence in Q4 2019)

Next key milestones
GLP tox results
Drug manufacture
FDA IND

How does KEY-Vaxx work?

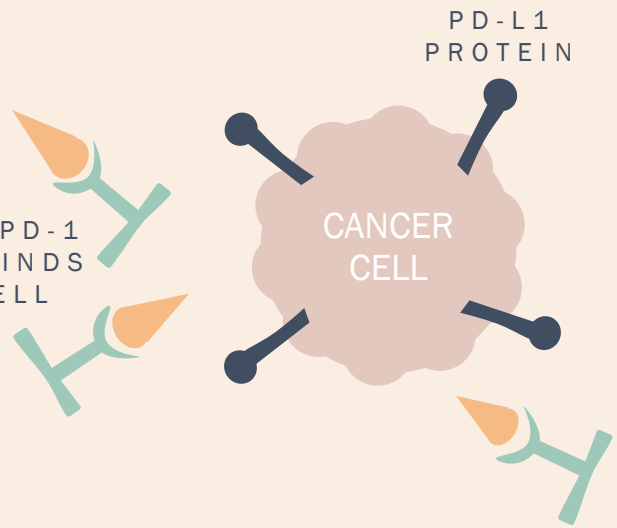
HOW CANCER STAYS UNDETECTED BY THE IMMUNE SYSTEM

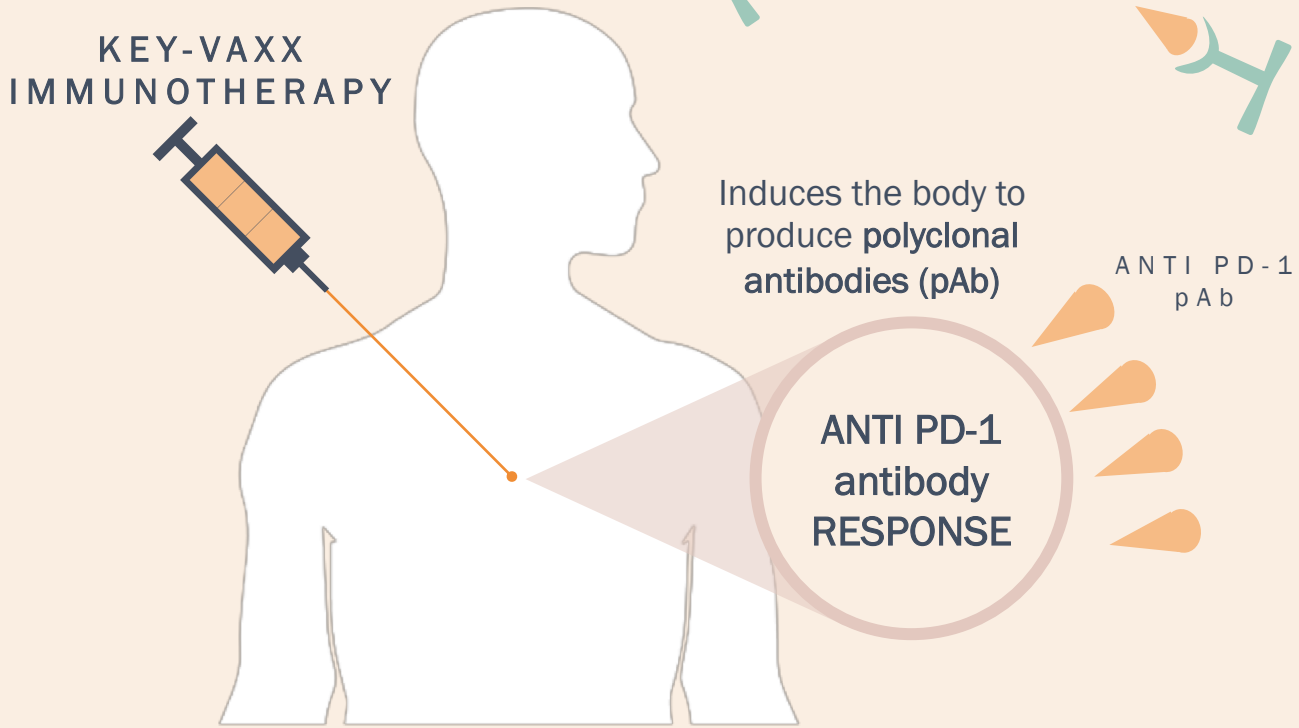


The PD-L1 protein binds to the PD-1 receptor and stops the T-Cell from recognising the cancer cell, allowing the cancer cell to survive and spread

KEY-VAXX STOPS THE CANCER CELL FROM AVOIDING T-CELL RECOGNITION AND KILLING

Gives T-cells the ability to recognise the cancer cell and mount an immune response



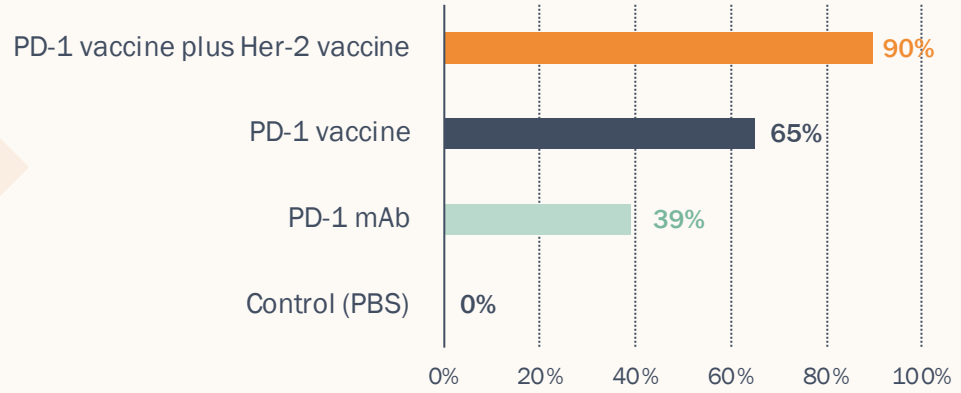


PD-1/HER-2 Combination: Potential to increase response rates in HER-2+ cancers

Immuno-oncology combinations driving value

- Combining drugs for **better immuno-oncology outcome** is driving value creation
- Big Pharma are looking for **novel combinations** that
  - ✓ Combine without increasing toxicity
  - ✓ Combine with minimal cost increase
  - ✓ Combine for better response rates and efficacy

% CANCER GROWTH INHIBITION IN COLORECTAL CANCER MODEL



Inhibition of cancer growth 16 days after infusion of cancer cells

Imugene's novel therapies have the potential to tick all three boxes

Opdivo / Yervoy Case Study

In 2018, the FDA approved the Opdivo and Yervoy combination for a subset of patients with metastatic colorectal cancer

Provides a novel therapeutic option with a higher response rate than that from monotherapy immunotherapy

BUT more significant toxicity is noted with the combination, and immune-mediated side effects need to be monitored

Although early in development, Imugene's PD-1 and Her-2 cancer vaccines potentially provide efficacy and response rate with minimal toxicity

KEY-Vaxx: Vaccine in Phase 1 development path

Current status

PRE-CLINICAL MILSTONES

- PD-1 candidate vaccine identified
- CMC manufacturing
- Successful pre-clinical FDA de-briefing meeting in Q1, 2019
- Finalise regulatory IND submissions Q3, 2019
- FDA/IND Granted by Q4, 2019
- Q4, 2019: Commence Phase 1

PROPOSED INPATIENT PHASES

Phase 1 – Dose Seeking /Signal Finding

- COHORT 3 | 3-6 PATIENTS
- COHORT 2 | 3-6 PATIENTS
- COHORT 1 | 3-6 PATIENTS

IDENTIFY

Optimal Biological Dose (OBD)

OUTCOMES

- ✓ Safety
- ✓ Immunogenicity
- ✓ tumour PD

Phase 2 – Expansions Assumption

Expansions

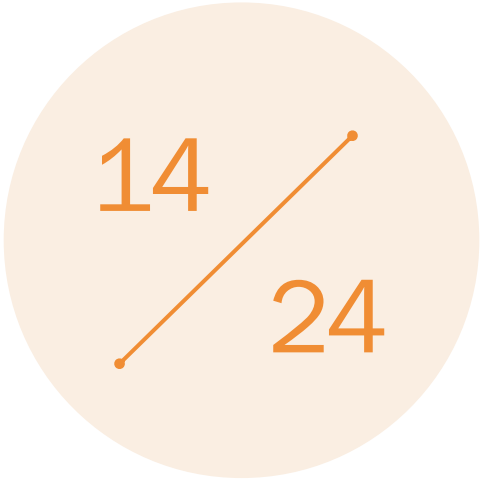
- Indication Expansion (12-20 patients)
- Indication Expansion (12-20 patients)

Proof of Concept

B- Vaxx: Phase 1 trial results leading into Phase 2

- Similar to HER-Vaxx, B-Vaxx is a B cell peptide cancer vaccine **designed to treat tumours that over-express the HER-2 receptor** by binding to the same regions as **Herceptin® and Perjeta®**
- **Funded by OSU**
- It has been shown in pre-clinical studies and in a completed **Phase I study to stimulate a potent polyclonal antibody response to HER-2**

Broad tumour types treated in Phase 1; now in Phase 2[1]



patients had stable disease

- ✓ 2 out of 24 patients had partial response
- ✓ 1 patient had Progression free survival at 40+ months
- ✓ Accepted for publication in peer reviewed journal

NO TOXICITY OBSERVED

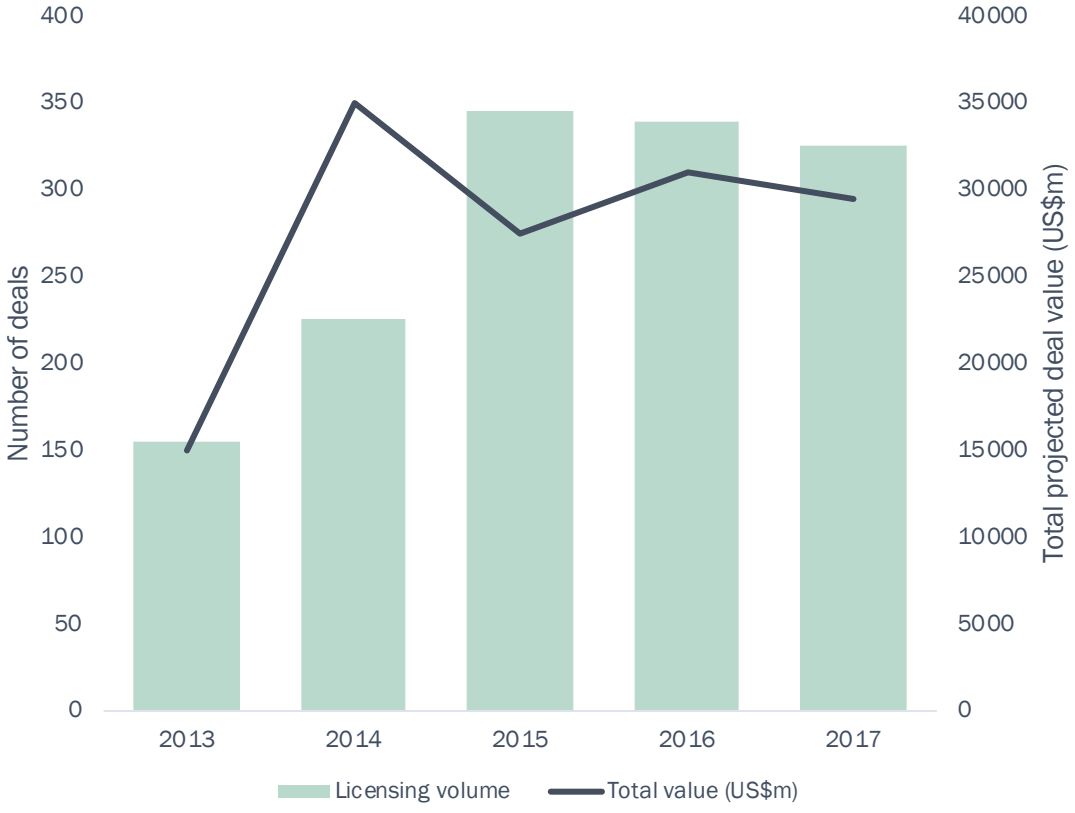
Note:

1. Phase Ib Immunotherapy Trial with a Combination of Two Chimeric (Trastuzumab-like and Pertuzumab-like) HER-2 B cell Peptide Vaccine emulsified in ISA 720 and nor-MDP Adjuvant in Patients with Advanced Solid tumours, Immunological Response and Clinical Outcome. Tanios Bekaii-Saab, Daniel H. Ahn, Christina Wu, Robert Wesolowski, Amir Mortazavi, Maryam Lustberg, Jeffrey Fowler, Bhuvaneswari Ramaswamy, Lai Wei, Jay Overholser and Pravin T.P. Kaumaya. Clinical Cancer Research manuscript accepted for publication March 2019.

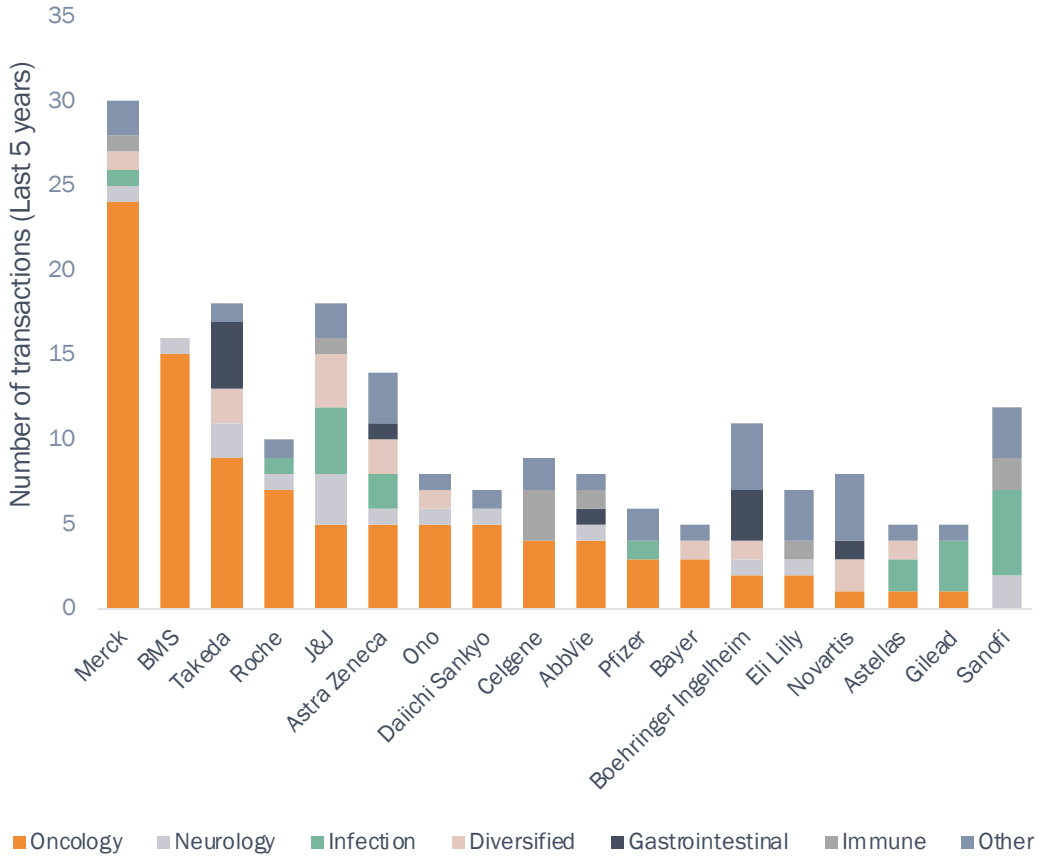
Oncology continues to dominate the deal making landscape

32 of the 35 multi-billion dollar oncology licensing deals in the last five years have focused on immuno-oncology

Licensing, joint ventures & research only oncology deals by volume & value (2013 to 2017)



Oncology dominates the deal making landscape



Source: Clarivate Analytics Cortellis

The immuno-oncology market is experiencing robust growth

Strong deal activity involving big pharma with a number of M&A and licensing transactions

		Acquisition value	Date	Upfront component	Research focus	Stage of clinical development
MERCK Acquired	Viralytics	A$500m	Jun 2018	A$500m	Oncolytic immunotherapy	Phase I and II
Roche License	Adaptive biotechnologies	US$2bn	Jan 2019	US$300m	Clinical Immunotherapy	Phase II
Lilly Acquired	UREVAC the RNA people	US$1.8bn	Oct 2017	~US$100m	Cancer Vaccine	Phase I
MERCK Acquired	IMMUNE DESIGN	US$300m	Feb 2019	Undisclosed	Cancer Vaccine	Phase II
MERCK Investment	moderna	US$125m	May 2018	Undisclosed	Cancer Vaccine	Phase I
AstraZeneca Investment	Daiichi-Sankyo	US$6.9bn	Mar 2019	US$1.35b	Oncolytic immunotherapy	Phase II

Strong sales for leading immuno-oncology treatments

KEYTRUDA (pembrolizumab) Injection 100 mg	US$7.2bn in 2018 sales
OPDIVO (nivolumab)	US$6.7bn in 2018 sales
Herceptin trastuzumab	US$7.1bn in 2018 sales
PERJETA pertuzumab	US$2.8bn in 2018 sales

In 2015 the immuno-oncology market was estimated at US$45bn and is expected to reach US$117bn by 2022

Robust cash position with supportive institutional shareholder base

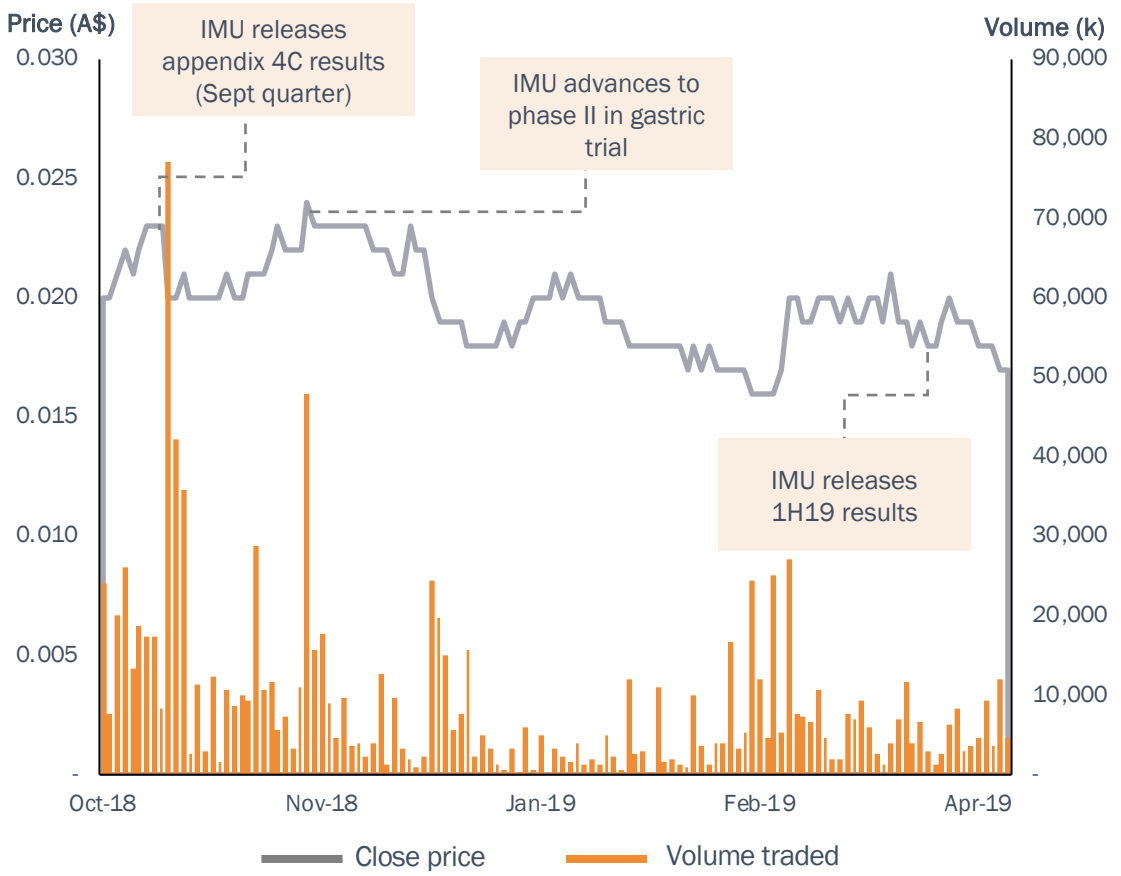
Public Market Overview

Share Price [1]	A$0.018
Market Capitalisation [2]	A$65.0M
Cash equivalents (Mar-19)	A$21.0M
Enterprise Value	A$44.0M

Top 5 Shareholders (as at April 2019)

Private Portfolio Management	6.2%
Platinum Asset Management	3.6%
Dr. Nicholas Smith	3.2%
Paul Hopper	2.1%
Sarah Cameron	1.7%

Share Price Performance (last 6 months)



Note:
1. As of 23 April 2019
2. Market capitalization calculations based on ordinary shares (3.61n) only and excludes the dilutive impact of options outstanding (625m)

Clinical development and milestones

Phase 2 clinical trials for key indications underway – trials underpinned by additional value-adding studies and an exciting pipeline

STUDIES	1Q CY2019	2Q CY2019	3Q CY2019	4Q CY2019
HER-Vaxx HER-2	**HER-Vaxx** 1st patient dosed in Phase 2	**HER-Vaxx Phase 2** Regular updates expected		
KEY-Vaxx PD-1	**KEY-Vaxx Phase 1** Preclinical tox and manufacturing nearing completion with FDA IND in Q3		**Key- Vaxx** Commence Phase 1	
B-Vaxx HER-2	**B-Vaxx** Phase 1 clinical data published with further updates expected			
Combo HER-2/PD-1	**Combo pre-clinical** Preclinical studies ongoing demonstrating benefits of combining IMU B cell vaccines in validated animal models of cancer			

With a proactive approach to business development and brand awareness through participation in key conferences and acceptance in peer reviewed journals

AACR American Association for Cancer Research

ESMO

ASCO AMERICAN SOCIETY OF CLINICAL ONCOLOGY

Gastrointestinal Cancers Symposium

IMUGENE
Developing Cancer Immunotherapies

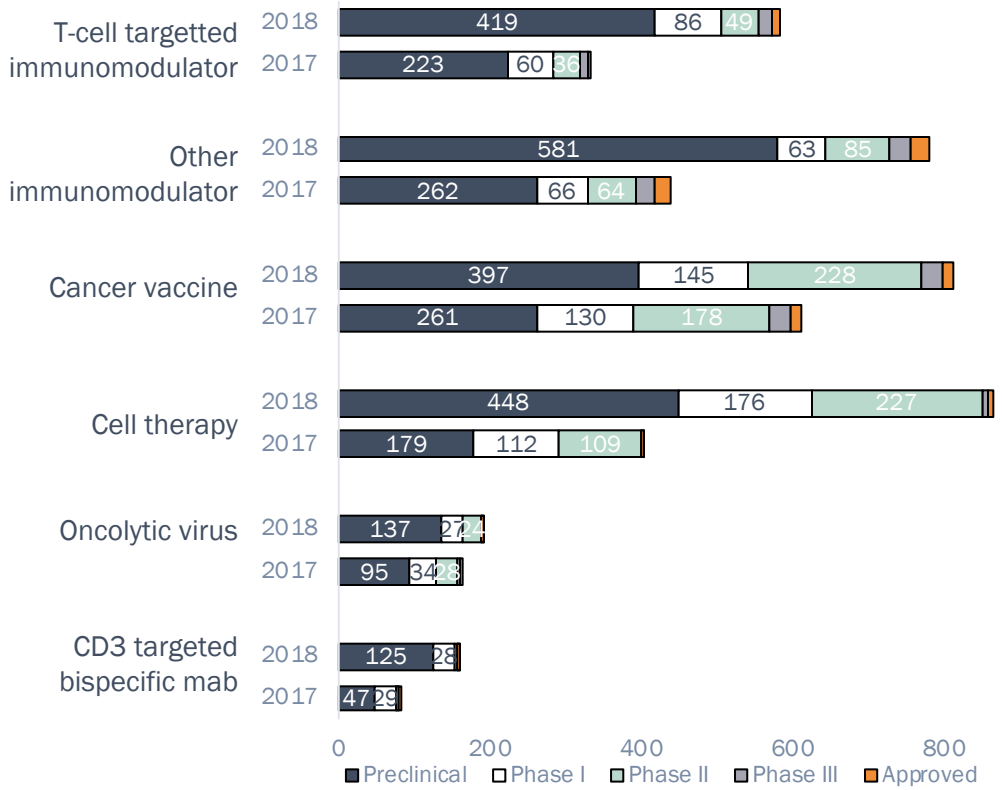
Appendix

The global immuno-oncology sector rapidly growing

With strong interest in the sector, Imugene's products have the potential to outperform exsiting treatments

- Traditionally, cancer treatment options included: surgery, radiation, chemotherapy, and targeted therapy
- Immunotherapy is rapidly evolving and now widely regarded as a 5th pillar of treatment
- Sector growing rapidly - more than 600 licensing agreements signed in the oncology space (1/3 of these focused on immuno-oncology)
- Potential benefits of B cell peptide vaccines include:
  - Cheaper to produce
  - Targeted and lasting immune response
  - Safer and more convenient

Significant growth in global immuno-oncology pipelines of 2017 and 2018



Source: www.cancerresearch.org

Other corporate activity in the immuno-oncology sector

Licensee	Licensor	Year	Technology / Mechanism of action	Phase of lead asset	I-O	Total ($ millions)	Upfront ($ millions)
Merck & Co.	AstraZeneca	2017	PD1/PDL1 small molecule combinations	Launched	✓	8,500	1,600
BMS	CytomX	2014	Immunotherapies using Probody Platform	Discovery	✓	5,028	50
Merck & Co.	Ablynx	2014	Multispecific antibodies against checkpoint proteins	Discovery	✓	4,563	27
Incyte	Merus	2016	Bispecific antibody platform	Discovery	✓	3,700	120
Celgene	OncoMed	2013	Anti stem cell products, incl. bispecific antibody	Phase 2	✓	3,332	155
Pfizer	Cellectis	2014	CART cell therapies	Discovery	✓	2,855	80
Pfizer	Merck KGaA	2014	PD1/PDL1 development, and co-promotion of Xalkori	Phase 2	✓	2,850	850
Celgene	Jounce	2016	I-O therapies	Discovery	✓	2,824	225
Sanofi	Regeneron	2015	Antibodies against LAG3, GITR and PDL1	Phase 1	✓	2,665	640
Novartis	Xencor	2016	Bispecific antibodies	Discovery	✓	2,560	150
J&J	Aduro BioTech	2014	Cancer vaccines using LADD immunotherapy platform	Discovery	✓	1,999	12
Servier	Pleris Pharmaceuticals	2017	Bispecific therapeutics using anticalin platform technology	Discovery	✓	1,831	31
Eli Lilly	CureVac	2017	Cancer vaccines using RNActive technology	Discovery	✓	1,803	50

Source: Clarivate Analytics Cortellis

Other corporate activity in the immuno-oncology sector

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Shire (Baxalta)	Symphogen	2016	Checkpoint inhibitors	Discovery	✓	1,775	175
Shire (Baxalta)	Precision BioSciences	2016	Allogeneic CART cell therapies using ARCUS genome-editing technology	Discovery	✓	1,705	105
Celgene	Acetylon	2013	HDAC inhibitors (incl. option to acquire Acetylon)	Phase 2		1,700	600
Sanofi	BionTech	2015	mRNA based immunotherapies	Discovery	✓	1,560	Undisclosed
Bayer	LoxoOncology	2017	Next-generation selective yrosine kinase inhibitors	Phase 2		1,550	400
Amgen	CytomX	2017	T cell engaging bispecific antibodies	Discovery	✓	1,465	40
Eli Lilly	Innovent Biologics	2015	Bispecific antibodies (incl. anti cMet and anti-CD20)	Phase 2	✓	1,456	56
Celgene	Bei Gene	2017	Anti-PD1 antibody, and marketing of Celgene's products in China	Phase 1	✓	1,393	263
GSK	Adaptimmune	2014	T cell therapy targeting the NY ESO antigen	Phase 2	✓	1,253	42
Arrys Therapeutics	AskAt	2017	Prostaglandin EP4 receptor antagonists	Phase 2	✓	1,200	Undisclosed
Celgene	Sutro Biopharma	2014	Antibody drug conjugates	Discovery	✓	1,185	Undisclosed
Novartis	Cerulean Pharma	2016	Nanoparticle-drug conjugates using Dynamic tumour Targeting technology	Discovery		1,173	5
Roche	Molecular Partners	2013	DARPin-drug conjugates	Discovery	✓	1,160	60

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Other corporate activity in the immuno-oncology sector

Licensee	Licensor	Year	Technology / Mechanism of action	Phase of lead asset	I-O	Total ($ millions)	Upfront ($ millions)
Roche (Genetech)	NewLink Genetics	2014	TDO/IDO inhibitors	Phase 1	✓	1,150	50
Servier	Cellectis	2014	T cell therapeutics, incl. UCART-19	Discovery	✓	1,120	10
Amgen	Kite Pharma	2014	CART cell therapies using autologous cell therapy (eACT) platform	Phase 2	✓	1,110	60
Gilead	MacroGenics	2013	Dual-Affinity Re-Targeting (DART) products	Discovery	✓	1,085	30
Merck KGaA	F-Star Alpha	2017	Bispecific antibodies, incl. anti-PDL1 antibody	Discovery	✓	1,067	66
Amgen	Immatics Biotechnologies	2017	T cell-engaging bispecific immunotherapies	Discovery	✓	1,030	30
Roche	Blueprint Medicines	2016	Small molecules against immunokinases	Discovery	✓	1,010	45
Servier	Sorrento	2016	Anti-PD1 antibody	Discovery	✓	1,000	28
Pfizer	BioAlta	2015	Conditionally Active Biologic (CAB) antibody-drug conjugates	Discovery	✓	1,000	Undisclosed

Source: Clarivate Analytics Cortellis

Intellectual Property

	Patent title	Description	Patent Number	Expiry Date	Territories
HER -Vaxx	'Vaccine against cancer diseases that are associated with the HER-2/neu Oncogene'	Protects specific HER-2 B-cell epitopes	WO02068474	27 Feb 2022	Granted in Australia, Europe, Canada, the USA and Israel
	'HER-2/neu Multi-peptide Vaccine'	Protects specific HER2 B-cell epitopes	WO2007118660	11 April 2027	Granted in Australia, Europe, Israel and Canada
	'Multi-epitope Vaccine for HER-2/neu-associated Cancers'	Protects fusion peptides comprising three noncontiguous B cell epitopes from the extracellular domain of HER-2/neu linked to one another and coupled with a virosome or carrier protein	WO2011020604	18 August 2030	Granted in the USA and in Europe.
	'A vaccine composition and uses thereof'	Protects and claims composition of matter on P467-CRM197/Montanide HER-Vaxx drug product used in Phase Ib/II trial ongoing.	WO2016164980	15 April 2036	Granted in AU, SG and pending in US, EU, CN, TW, SK, IN, BR, NZ, JP
KEY - Vaxx	'A vaccine composition and uses thereof'	Protects multiple PD-1 peptide sequences to include in PD-1 vaccines. Protects methods of treatment.	PCT/AU2019/050089	7 Feb 2038	PCT filed. National Phase countries to include AU, US, EU, CN, TW, SK, IN, BR, NZ, JP
	'Human PD1 peptide vaccines and uses thereof'	Protects specific PD-1 B-cell epitopes developed at OSU by Prof Kaumaya	PCT/US2018/024831 WO2018183488	28 March 2037	PCT filed. National Phase countries to include AU, US, EU, CN, TW, SK, IN, BR, NZ, JP

Intellectual Property covering B-Vaxx and other tumour targets developed at OSU are also licensed and owned by Imugene

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