B Cell Based Antibodies for Immuno-Oncology

Leslie Chong
Chief Executive Officer
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.
What Does Imugene Do?

We are developing cancer immunotherapy drugs based on antibodies - one of the key defenses of the human immune system.
IMU’s Value Proposition

✓ Promising science with impeccable provenance in the hottest area of cancer today - cancer immunotherapy

✓ Deep Pipeline: HER-Vaxx & Mimotopes

✓ Breast Cancer clinical trial complete & on the cusp of starting our second Phase 1b/2 clinical trial in gastric cancer

✓ Tight share register with leading Funds Manager, Platinum, as our largest shareholder

✓ Frequent, rich, quality news flow ahead

✓ Axel Hoos head of immuno – oncology at GSK, plus team with successful track record in drug development & strong dedication & commitment

✓ Low market cap - undervalued against ASX peers
Imugene Operates in the most Promising area of Oncology Today...

Imugene is an immunotherapy company developing B-cell based vaccines in the most promising area of oncology today – IMMUNO-ONCOLOGY
What is Immunotherapy?

- Immunotherapy is the treatment of cancer with substances or drugs that stimulate the patient’s immune response – known as active immunisation.
- Unlike chemotherapy, immunotherapy drugs do not target the cancer directly.
- Immunotherapy helps the patient’s own immune system recognise & attack cancer cells.
- Typical immune responses are:
  - B Cells making antibodies to attack the cancer
  - T Cells developed by the thymus to attack the cancer.
Two Compelling Antibody Programs and Commercial Opportunities

**Building on the multi-levels of your own immune system**

- Identification of cancer targets for variety of cancer indications
- Immune responses from conjugates and adjuvants
- B-Cell Peptide vaccines against checkpoint targets
What is an Antibody?  
A key Defense of the Immune System

**Antibodies** – look like the letter “Y” and are made of proteins. They are exquisitely made to attach themselves to one target only sitting on an invading organism which the body doesn’t like.

There are 2 ways to make antibodies

**In a factory**

For example, Roche’s Herceptin for breast cancer

**Using B cells in your own body**

**B Cells** – are like little antibody factories producing millions of antibodies to target “nasties” entering the body
Advantages of B-Cell Based Antibodies

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

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.
A Mimotope Produces a Copy of an Antibody

• 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 it 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”

• Mimotopes to be part of the next wave of the immuno-oncology revolution against cutting edge oncology targets

• Potential tool for selecting novel vaccine candidates against a variety of tumors

• Greatly extends IMU’s oncology franchise and pipeline.

• Monoclonal antibody market currently at US$60bn pa
HER-Vaxx: Mechanism of Action – How it Works

B-cell Activation

HER-Vaxx
Antibody Secretion

Tumor Cell

HER-2/neu

3 Peptides

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

For personal use only
Phase 1 in Breast Cancer, Completed at Medical University of Vienna

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

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

Phase 1b/2, in Gastric Cancer

Phase 1b lead-in
- Open label
- ~18 patients in 3 cohorts of up to 6 pts per cohort
- Combination with chemo
- 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

- 08-Nov, 2016: Phase 1b/2 Commences
- Q4, 2016: Patient Enrolled
- Q1-Q2, 2017: Early Patient Data Available
- Q3 2017: Interim Ph1b Patient Data Available
- Q4 2017: Final Ph1b Patient Data Available
Huge Gastric Market Opportunity

- 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
- Asia is the largest market for gastric cancer globally
### 2015 Big Pharma Antibody Deals

20% of the top 10 Big Pharma deals in 2015 were in the antibody space

<table>
<thead>
<tr>
<th>Licensee</th>
<th>Licensor</th>
<th>Total Size (US $M)</th>
<th>Upfront (US $M)</th>
<th>Subject</th>
<th>Stage</th>
<th>Primary Rx Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanofi</td>
<td>Hanmi</td>
<td>$4,266</td>
<td>$445</td>
<td>Sanofi to develop Hanmi’s Portfolio (specifically 3 assets) of long-acting diabetes treatment</td>
<td>Reformulation</td>
<td>Endo/Meta</td>
</tr>
<tr>
<td>AstraZeneca (fka Isis)</td>
<td>Ionis</td>
<td>$4,090</td>
<td>$65</td>
<td>Discovery and development of antisense therapies for cardiovascular, metabolic and renal diseases</td>
<td>Discovery</td>
<td>Diversified</td>
</tr>
<tr>
<td>Vertex</td>
<td>CRISPR</td>
<td>$2,625</td>
<td>$75</td>
<td>Vertex and CRISPR to use CRISPR-cas9 gene editing technology to discover and develop new treatment for genetic diseases</td>
<td>Discovery</td>
<td>Diversified</td>
</tr>
<tr>
<td>Gilead</td>
<td>Galapagos</td>
<td>$2,075</td>
<td>$300</td>
<td>Gilead Sciences to develop and commercialize Galapagos' filgotinlb against rheumatoid arthritis</td>
<td>Phase II</td>
<td>AI/Inflam</td>
</tr>
<tr>
<td>Pfizer</td>
<td>Heptares</td>
<td>$1,890</td>
<td>Undisclosed</td>
<td>Heptares and pfizer to develop novel drugs targeting GPCR against multiple therapeutic indications</td>
<td>Discovery</td>
<td>Diversified</td>
</tr>
<tr>
<td>BMS</td>
<td>Five Prime</td>
<td>$1,740</td>
<td>$350</td>
<td>BMS to develop and commercialize Five Prime’s CSF1R antibody program, including FPA-008 for immunology and oncology</td>
<td>Phase I</td>
<td>Diversified</td>
</tr>
<tr>
<td>Sanofi</td>
<td>Lexicon</td>
<td>$1,730</td>
<td>$300</td>
<td>Sanofi to develop and commercialize Lexicon’s sotagliflozin against diabetes, with an option to license</td>
<td>Phase III</td>
<td>Endo/Meta</td>
</tr>
<tr>
<td>Amgen</td>
<td>Xencor</td>
<td>$1,702</td>
<td>$45</td>
<td>Amgen to develop and commercialize Xencor’s bispecific cancer immunotherapy and inflammation programs</td>
<td>Preclinical</td>
<td>Diversified</td>
</tr>
<tr>
<td>Sanofi</td>
<td>Regeneron</td>
<td>$1,665</td>
<td>$640</td>
<td>PD-1 inhibitor and other new immuno-Oncology antibodies, with an option</td>
<td>Phase I</td>
<td>Cancer</td>
</tr>
<tr>
<td>Ultragenyx</td>
<td>Arcturus</td>
<td>$1,570</td>
<td>$10</td>
<td>Arcturus and Ultragenyx to discover and develop mRNA therapeutics using UNA Oligomer chemistry and LUNAR nanoparticle delivery platform</td>
<td>Discovery</td>
<td>Diversified</td>
</tr>
</tbody>
</table>
### What Could an IMU Deal Look Like?

#### Top 20 Licenses with Upfront Payments > $50m

<table>
<thead>
<tr>
<th>Licensee</th>
<th>Licensor</th>
<th>Upfront ($M)</th>
<th>Equity ($M)</th>
<th>Stage</th>
<th>Rx Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanofi</td>
<td>Regeneron</td>
<td>$640</td>
<td></td>
<td>Phase I</td>
<td>Cancer</td>
</tr>
<tr>
<td>Celgene</td>
<td>Med Immune / AZ</td>
<td>$450</td>
<td></td>
<td>Phase III</td>
<td>Cancer</td>
</tr>
<tr>
<td>Sanofi</td>
<td>Hanmi</td>
<td>$445</td>
<td></td>
<td>Reformulation</td>
<td>Endo/Meta</td>
</tr>
<tr>
<td>Bristol-Myers Squibb</td>
<td>Five Prime</td>
<td>$350</td>
<td></td>
<td>Phase I</td>
<td>Diversified</td>
</tr>
<tr>
<td>Astellas</td>
<td>Immunomic</td>
<td>$300</td>
<td></td>
<td>Discovery</td>
<td>Al/Inflam</td>
</tr>
<tr>
<td>Gilead</td>
<td>Galapagos</td>
<td>$300</td>
<td>$425</td>
<td>Phase II</td>
<td>Al/Inflam</td>
</tr>
<tr>
<td>Sanofi</td>
<td>Lexicon</td>
<td>$300</td>
<td></td>
<td>Phase III</td>
<td>Endo/Meta</td>
</tr>
<tr>
<td>MedImmune / AZ.</td>
<td>Innate</td>
<td>$250</td>
<td></td>
<td>Phase II</td>
<td>Cancer</td>
</tr>
<tr>
<td>Allergan</td>
<td>Merck</td>
<td>$250</td>
<td></td>
<td>Phase II</td>
<td>Neurology</td>
</tr>
<tr>
<td>Novartis</td>
<td>Aduro</td>
<td>$200</td>
<td>$25</td>
<td>Preclinical</td>
<td>Cancer</td>
</tr>
<tr>
<td>Celgene</td>
<td>Juno</td>
<td>$150</td>
<td>$850</td>
<td>Phase II</td>
<td>Diversified</td>
</tr>
<tr>
<td>Celgene</td>
<td>Nurix</td>
<td>$150</td>
<td></td>
<td>Discovery</td>
<td>Diversified</td>
</tr>
<tr>
<td>MerckKGaA</td>
<td>Intrexon</td>
<td>$115</td>
<td></td>
<td>Discovery</td>
<td>Cancer</td>
</tr>
<tr>
<td>Celgene</td>
<td>Lycera</td>
<td>$105</td>
<td></td>
<td>Phase I</td>
<td>Cancer</td>
</tr>
<tr>
<td>Janssen</td>
<td>Hanmi</td>
<td>$105</td>
<td></td>
<td>Phase I</td>
<td>Endo/Meta</td>
</tr>
<tr>
<td>Bayer</td>
<td>Ionis (fka ISIS)</td>
<td>$100</td>
<td></td>
<td>Phase II</td>
<td>Cardiovascular</td>
</tr>
<tr>
<td>DiaVax</td>
<td>City of Hop</td>
<td>$100</td>
<td></td>
<td>Phase I</td>
<td>Viral Infection</td>
</tr>
<tr>
<td>Bayer</td>
<td>Ionis (fka ISIS)</td>
<td>$100</td>
<td></td>
<td>Phase II</td>
<td>Hematologic</td>
</tr>
<tr>
<td>Merck</td>
<td>NGM</td>
<td>$914</td>
<td>$106</td>
<td>Preclinical</td>
<td>Endo/Meta</td>
</tr>
<tr>
<td>Vertex</td>
<td>Parion</td>
<td>$80</td>
<td></td>
<td>Phase II</td>
<td>Pulm/Resp</td>
</tr>
</tbody>
</table>

Highlights indicate Phase I Licensing

# Valuation and Licensing Deals in Immuno-Oncology

## Valuation of Companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Valuation (USDm)</th>
<th>Development Stage of lead drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agios Pharmaceuticals, Inc.</td>
<td>$1.829</td>
<td>Phase 3</td>
</tr>
<tr>
<td>Karyopharm Therapeutics, Inc.</td>
<td>$288</td>
<td>Phase 2</td>
</tr>
<tr>
<td>Dicerna Pharmaceuticals, Inc.</td>
<td>$68</td>
<td>Phase 1</td>
</tr>
<tr>
<td>Immune Design Corp.</td>
<td>$167</td>
<td>Phase 2</td>
</tr>
<tr>
<td>Heat Biologics, Inc.</td>
<td>$14</td>
<td>Phase 2</td>
</tr>
<tr>
<td>Loxo Oncology, Inc.</td>
<td>$514</td>
<td>Phase 1</td>
</tr>
<tr>
<td>Epizyme, Inc.</td>
<td>$597</td>
<td>Phase 2</td>
</tr>
<tr>
<td>Kite Pharma, Inc.</td>
<td>$2,609</td>
<td>Phase 1/2</td>
</tr>
<tr>
<td>Idera Pharmaceuticals, Inc.</td>
<td>$185</td>
<td>Phase 1/2</td>
</tr>
<tr>
<td>Ignyta, Inc.</td>
<td>$213</td>
<td>Phase 1/2</td>
</tr>
<tr>
<td>Inovio Pharmaceuticals, Inc.</td>
<td>$716</td>
<td>Phase 2</td>
</tr>
<tr>
<td>Five Prime Therapeutics, Inc.</td>
<td>$1.150</td>
<td>Phase 1</td>
</tr>
<tr>
<td>OncoMed Pharmaceuticals, Inc.</td>
<td>$387</td>
<td>Phase 2</td>
</tr>
</tbody>
</table>

**Mean:** $672

## Licensing Deals

<table>
<thead>
<tr>
<th>Licensing Deals</th>
<th>Upfront (includes equity &amp; cash) USDm</th>
<th>Milestone payments (USDm)</th>
<th>Upfront Payment as % of Total</th>
<th>Total deal size</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>999.8</td>
<td>1835</td>
<td>100%</td>
<td>2,012.3</td>
</tr>
<tr>
<td>Mean</td>
<td>87.6</td>
<td>433</td>
<td>22.9%</td>
<td>514.6</td>
</tr>
<tr>
<td>Median</td>
<td>35.0</td>
<td>309</td>
<td>10.3%</td>
<td>363.5</td>
</tr>
<tr>
<td>Low</td>
<td>1.0</td>
<td>0</td>
<td>0.7%</td>
<td>1.0</td>
</tr>
</tbody>
</table>

The average total deal size is $514.6m, and the median deal size is $363.5m.
Strong News Flow in the next 12 Months

- Patients dosed in the Phase 1b/2 trial in gastric cancer (2H, 2016)
- Publication in BMC cancer journal
- Patent filings on mimotopes (1H, 2017)
- Recruitment progress and interim Phase 1b/2 data
- First mimotope drug candidate identified

- Preclinical in vivo/vitro results (2H, 2017)
- Final Phase 1b/2 trial readout (2H, 2017)
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 Ipilimumab at Bristol-Myers Squibb
- Co-Director of the think-tank Cancer Immunotherapy Consortium; *Imugene is his only Board seat worldwide*

Paul Hopper
*Executive Chairman*
- International & ASX biotech capital markets experience particularly in immuno-oncology & vaccines
- Chairman of Viralytics, Director of Prescient, Founder of Polynoma LLC, former Director pSivida, Somnomed & Fibrocell Science
- Head of Life Sciences Desk & Australia Desk at Los Angeles-based investment bank, Cappello Group

Prof Ursula Wiedermann
*Chief Scientific Officer*
- Co-inventor of Her-Vaxx; inventor of mimotope platform technology
- Professor of Vaccinology at Medical University of Vienna

Dr Nick Ede
*Chief Technology Officer*
- Over 25 years peptide vaccine and drug development
- Former CTO Consegna, CEO Adistem Ltd, CEO Mimotopes P/L, COO EQiTX Ltd (ZingoTX & VacTX)
- VP Chemistry Chiron (now Novartis), Research Fellow CRC Vaccine Technology

Dr Anthony Good
*Clinical Program Manager*
- Over 15 years oncology & immunology experience in global clinical development programs. Integral to the development of significant new medicines including Viagra, Revatio, Lipitor, Selzentry and Somavert.
- Ex Pfizer Global Research and Development, Covance Clinical and Periapproval Services and Western Sydney University
Comparable Companies

$ USD

Market Cap April, 2016  Market Cap Nov, 2016

19m
Business Strategy and Partnering Opportunities

- **2016/17**: Phase 1b Gastric Study
- **2017-2018**: Phase 1b Mimotope + others
- **2017-2018?**: License/Partner
- **2017-2018?**: Big Pharma?
IMU’s Value Proposition

✓ Promising science with impeccable provenance in the hottest area of cancer today - cancer immunotherapy

✓ Deep Pipeline – HER-Vaxx & Mimotopes

✓ Breast Cancer clinical trial complete & on the cusp of starting our second Phase 1b/2 clinical trial in gastric cancer

✓ Tight share register with leading Funds Manager, Platinum, as our largest shareholder

✓ Frequent, rich, quality news flow ahead

✓ Axel Hoos head of immuno – oncology at GSK, plus team with successful track record in drug development & strong dedication & commitment

✓ Low market cap - undervalued against ASX peers
Contact

Leslie Chong
Chief Executive Officer
leslie.chong@imugene.com
+61 458 040 433