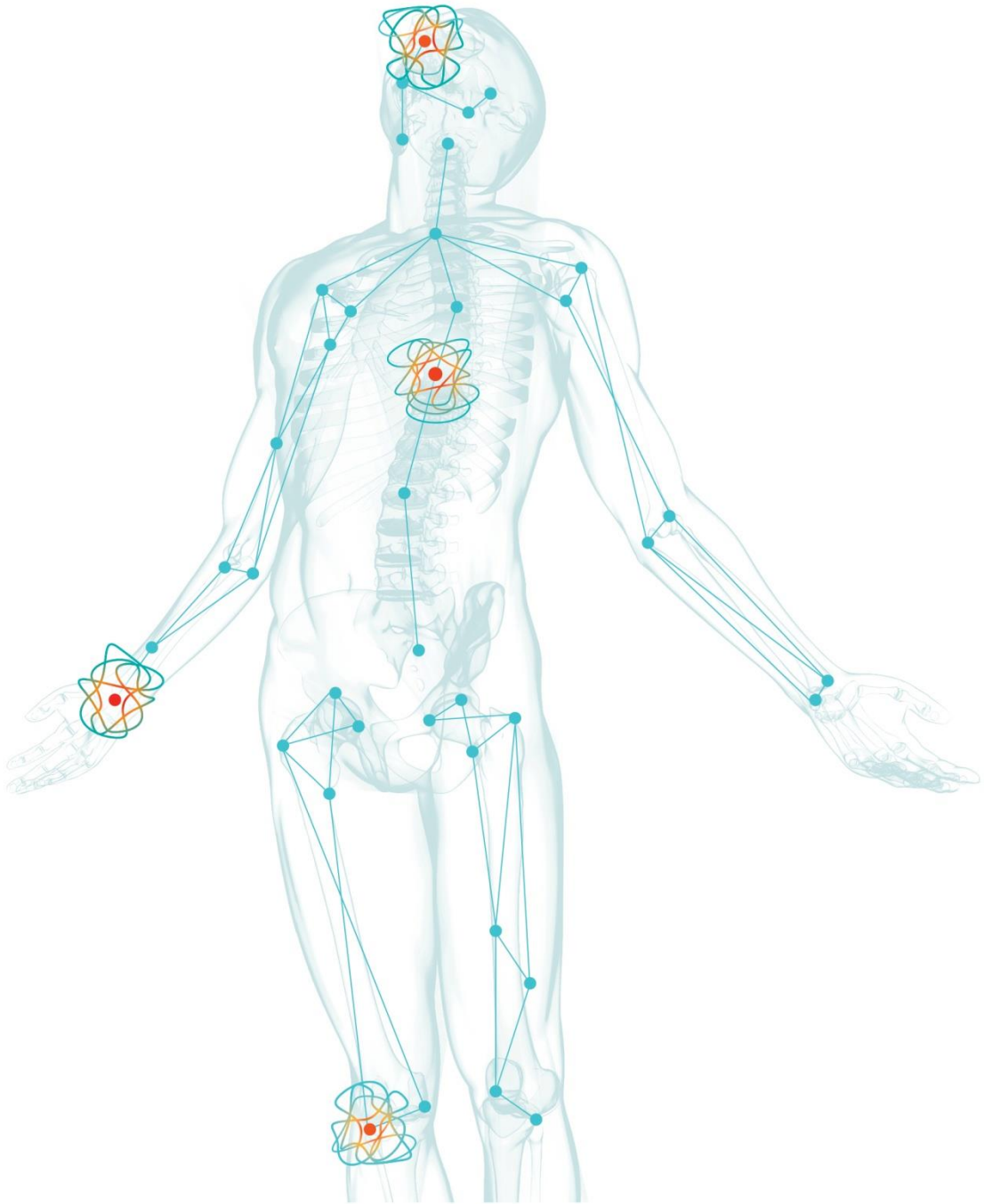
paradigm
BIOPHARMA

Investor Presentation

Paul Rennie, CEO & MD

April 2018



Disclaimer

This document, together with any information communicated by Paradigm Biopharmaceuticals Ltd (known as “Paradigm”, “Paradigm Biopharma” or “the Company”), in any presentation or discussion relating to this document (collectively, “Information”) is confidential, and has been prepared by the Company on the condition that it is for the exclusive information and use of the recipient. The Information is proprietary to Paradigm and may not be disclosed to any third party or used for any other purpose without the prior written consent of the Company.

The Information is based upon management forecasts and reflects prevailing conditions, which are accordingly subject to change. In preparing the Information, the Company has relied upon and assumed, without independent verification, the accuracy and completeness of all information available from public sources, or which was otherwise reviewed by it. In addition, the analyses are not and do not purport to be appraisals of the assets, stock or business of the Company. Even when the Information contains a kind of appraisal, it should be considered preliminary, suitable only for the purpose described herein and should not be disclosed or otherwise used without the prior written consent of Paradigm. The Information is provided on the understanding that unanticipated events and circumstances may occur which may have significant valuation and other effects.

Corporate Overview

- **Paradigm Biopharmaceuticals Ltd** is an ASX-listed biopharmaceutical company focused on finding new clinical indications for an already approved drug.
- Paradigm is repurposing PPS for a number of applications with a focus on treatment of **arthritis, respiratory and cardiovascular** indications giving us **"multiple shots on goal"**
- Experienced Board and management
- **Investment proposition for finding new clinical indications for an already approved drug;**
  - Saves time, save money, less clinical and manufacturing risk
  - Phase 2 catalysts Q4 CY2018

Financial information

Share price (21-March-18)	A$0.30
Number of shares	120.6m
Market capitalisation	**A$36m**
Cash (31-Dec-17) – no debt	~A$6.0m
Enterprise value	**A$30m**

Top shareholders[1,2]	Shares (m)	%
Paul Rennie (Managing Director)	21.5	21.1%
MJGD Nominees *(technology vendor)*	6.9	6.8%
Other Board and management	7.1	7.0%
Irwin Biotech *(technology vendor)*	6.3	6.2%

Note: 1. Blue shading represents Board and management holdings 2. MJGD Nominees and Irwin Biotech are select vendors of Xosoma, which was acquired by Paradigm prior to listing

Drug Repurposing Strategy

Much lower cost, accelerated timeline, lower risk and with higher rates of success

- **Lower cost:** average development cost of ~US$30-50m compared to US$1.3bn for "de novo" development[1]
- **Faster:** FDA 505(b)(2) pathway leveraging previous clinical efforts**,** which accelerates the development timeline
- **Lower risk:** safety already established so less chance of failure (safety issues account for 30% of clinical failures[1])
- **Higher success rates:** 25% chance of successful commercialisation compared to 10% for "de-novo" drugs[1]
- **Repurposed drugs have the same potential** to reach 'blockbuster drug status' as de novo drugs

Standard clinical development[1,2]

10-17 year process

Discovery & pharmacology	Preclinical testing	Phase I clinical trials	Phase II clinical trials	Phase III clinical trials	Regulatory approval
2 – 3 years	5 – 6 years		2 – 6 years		1 – 2 years

Paradigm's drug repurposing timeline

3-5 year process to approval

Often only 1 pivotal Phase II trial Can use RWE open label case studies	1 pivotal Phase III trial for each indication	Regulatory approval
1 year	1 – 2 years	1 – 2 years

Source:
1. Khanaoure A, Chuki P & De Sousa A (2014)
2. Ashurn T & Thor K (2004)

Board and Management

High quality Board and management, with top-tier pharmaceutical experience

- Board and management are renowned leaders in the biopharmaceutical industry, having held senior management positions with top ASX-listed companies, CSL (CSL.ASX) and Mesoblast (MSB.ASX)
- Extensive experience bringing biopharmaceutical products from clinical development to commercialisation

Board and management

Graeme Kaufman – Non-executive Chairman
- Broad experience in development and commercialisation of pharmaceutical drugs, previously CFO at CSL, executive VP of Mesoblast and Chairman of Bionomics (BNO)

Paul Rennie – Managing Director
- Extensive experience in drug development and commercialisation, previously COO & Executive VP, New Product Development of Mesoblast

John Gaffney – Non-executive Director
- 30+ years experience as a lawyer, previously Director of Patrys (PAB.ASX)

Christopher Fullerton – Non-executive Director
- Chartered Accounting and investment banking expertise, previously Non-executive Chairman of Bionomics and Cordlife (now Life Corporation (LFC.ASX))

Dr Ravi Krishnan – Chief Scientific Officer
- Significant experience in experimental pathology and investigating novel compounds with immune modulatory effects and anti-inflammatory properties

Kevin Hollingsworth – CFO & Company Secretary
- Previously CFO and Co-Sec of Mesoblast and Patrys (PAB.ASX)

Osteoarthritis with Bone Marrow Lesions

TGA Special Access Scheme – Real World Evidence – 45 patients treated

All patients (median age of 57.5 years - range 31 to 84 years) had pain and failed current standard of care - analgesics, NSAIDs or corticosteroids.

At six weeks after the initiation of PPS treatment:

Pain

- 38 out of 45 patients (84.4%) showed a reduction in pain;

Function

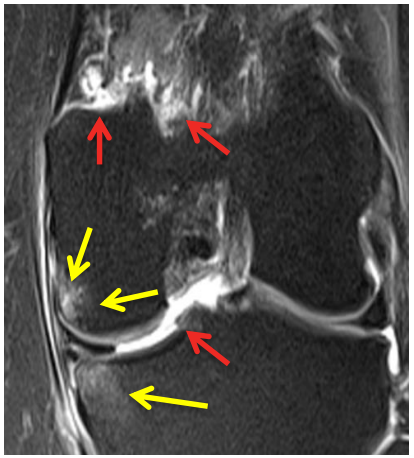
- 38 out 45 patients (84.4%) showed an improvement in knee function;

Patient A MRI – Pre PPS Treatment

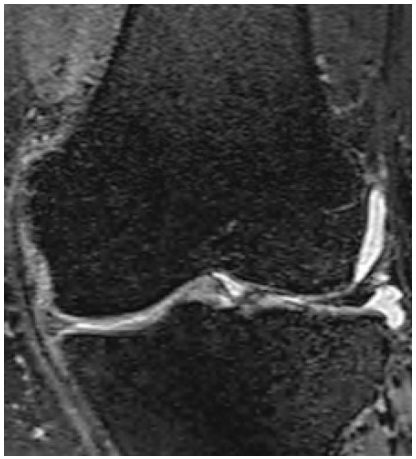
Pre treatment Scores

- High NRS Pain Score = **8**
- Lysholm Score: **37 (Poor knee function)**

BME Lesions
Joint Space Effusions



Patient A MRI – Post PPS Treatment



Post Treatment Results

- **Complete resolution** of BME lesions and effusions
- Pain NRS = **0 (pain resolved)**
- Lysholm Score: **65 (Fair knee function)**

Osteoarthritis with Bone Marrow Lesions

Osteoarthritis - A blockbuster indication with no effective treatments

Osteoarthritis and bone marrow lesions

- **BML are commonly associated with OA** and have been **linked to early onset of OA** and joint cartilage degeneration.[1]
- BML sustains inflammation and the release of MMP's and ADAMTS-5 enzymes, causing cartilage degeneration
- Resolution of the BML, **reduces inflammation and promotes joint health**
- Patients treated with PPS have reported **statistically significant improvement in pain and function**
- **Osteoarthritis** is the most common form of arthritis, affecting over **31 million people** in the United States, with over 36 million outpatient visits and 750,000 hospitalisations per year.[2]

OA Market Facts:

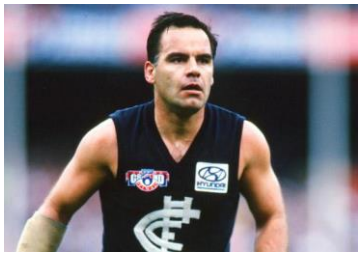
Market of therapeutics to treat OA

~US$5 billion pa Globally[3]

Cost to US Economy

US$128+ billion pa[4]

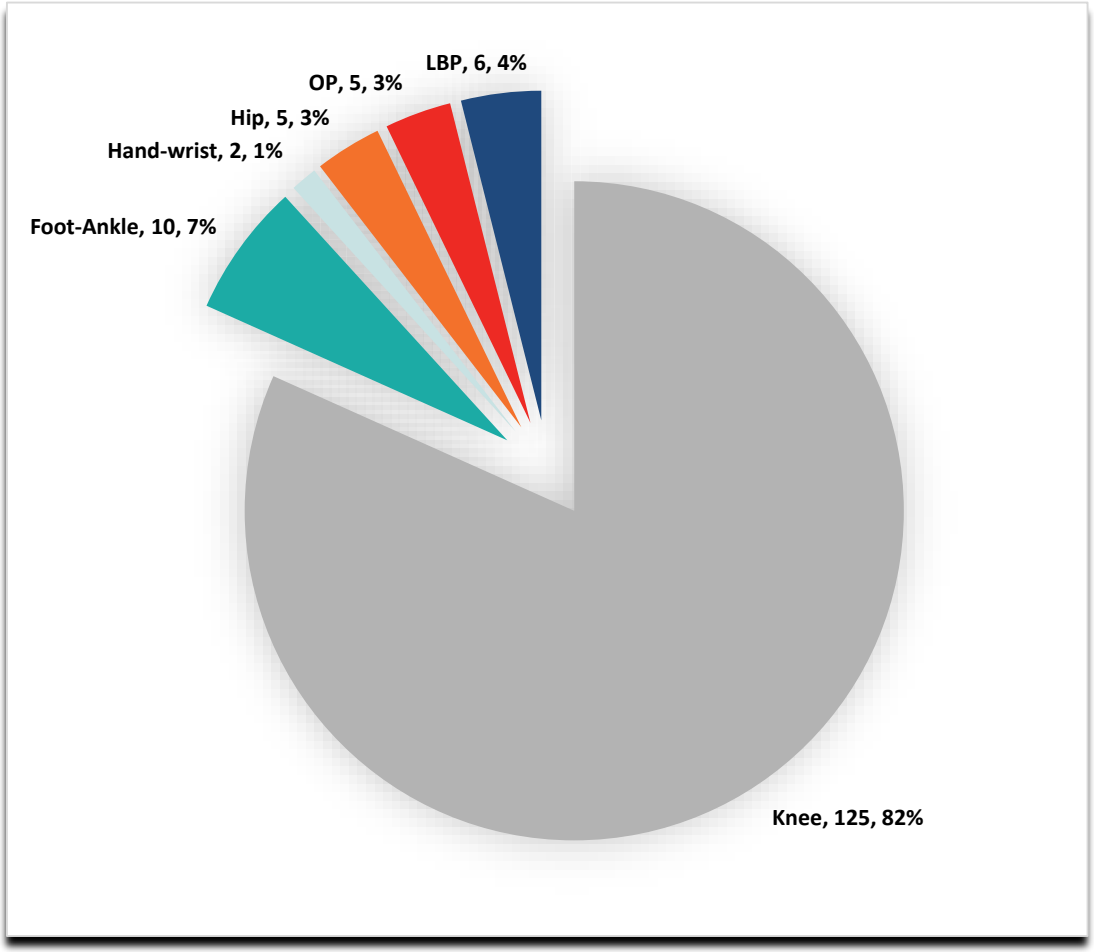
AFL Legend Greg 'Diesel' Williams diagnosed with OA, experienced significantly improved pain and function scores post PPS treatment



Source:

1. The occurrence and progression of BMLs have been shown to be associated with progression to osteoarthritis and joint pain (Osteoarthritis and Cartilage 2012, 20:1514-1518) and (Rheumatology 2010, 49:2413-9).
2. http://ard.bmj.com/content/annrheumdis/early/2017/07/12/annrheumdis-2017-211396.full.pdf
3. National Institute of Health; Emerging drugs for osteoarthritis; Hunter DJ and Matthews G 16(3): 479–491; 2011 September.
4. *Ibid.*

TGA-SAS program: 147 OA patients - completed or undergoing PPS treatment for BML



- Knee and other musculoskeletal indications
- Complete data set on 45 patients with knee OA
- Efficacy: Pain and Function
- Publication Plan:
- Conference presentation

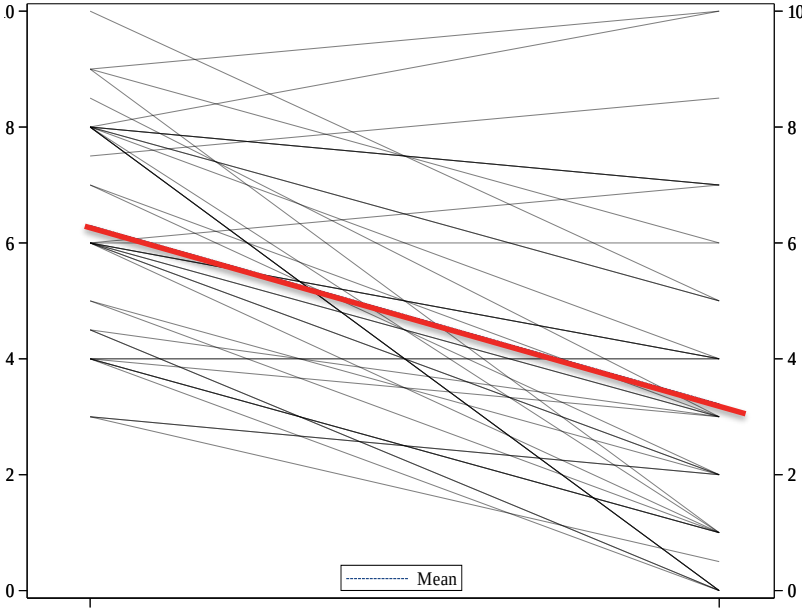
TGA-SAS program:

45 patients with BML treated with PPS for Knee Pain and Function

A Paired t-test was used to compare the before and after scores for knee pain (NRS) and knee function (LKS).

Pain (NRS) Before-after=3.1 p<0.0001

- **50% reduction in knee pain**

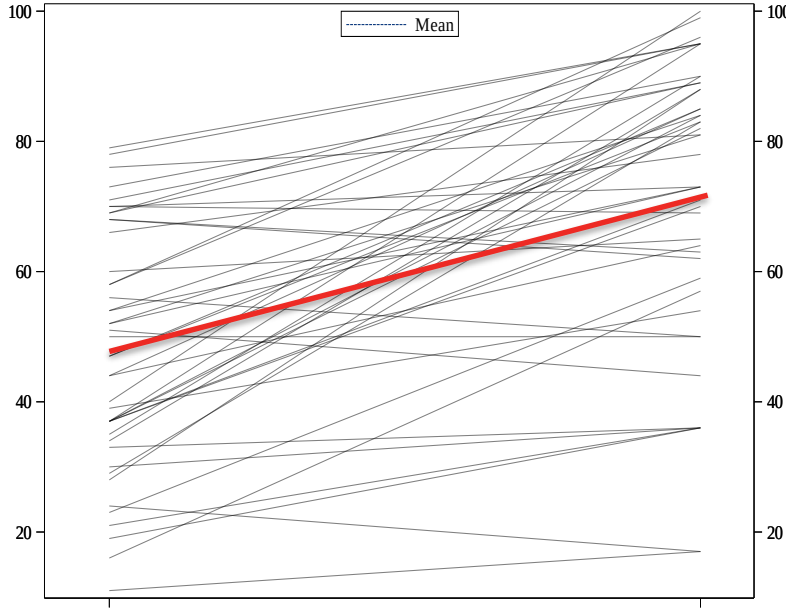


Before **After**

6.3 **3.2**

Function (LKS) Before-after=23.5 p<0.0001

- **64% improvement in knee function**



Before **After**

47.8 **71.3**

Osteoarthritis with BML: The Market for PPS (ZILOSUL®)

ZILOSUL® has the potential to fill the current gap in osteoarthritis treatment options

- There is currently **no effective treatment for osteoarthritis and BMLs** that treats the underlying pathology of the disease.
- **Current therapies treat the symptoms** of osteoarthritis and bone marrow edema lesions but **prolonged use results in undesirable side-effects.** It is widely accepted that NSAIDs and corticosteroids are contraindicated having a detrimental effect on the metabolism of bone and cartilage.
- **Opioid's are widely misused globally as patients form serious addictions whilst mitigating pain.**[1]
- **ZILOSUL® treats the underlying pathology of osteoarthritis** by reducing inflammation, resolving the bone marrow edema lesions and down regulating cartilage degrading enzymes (MMP's and ADAMTS-5).

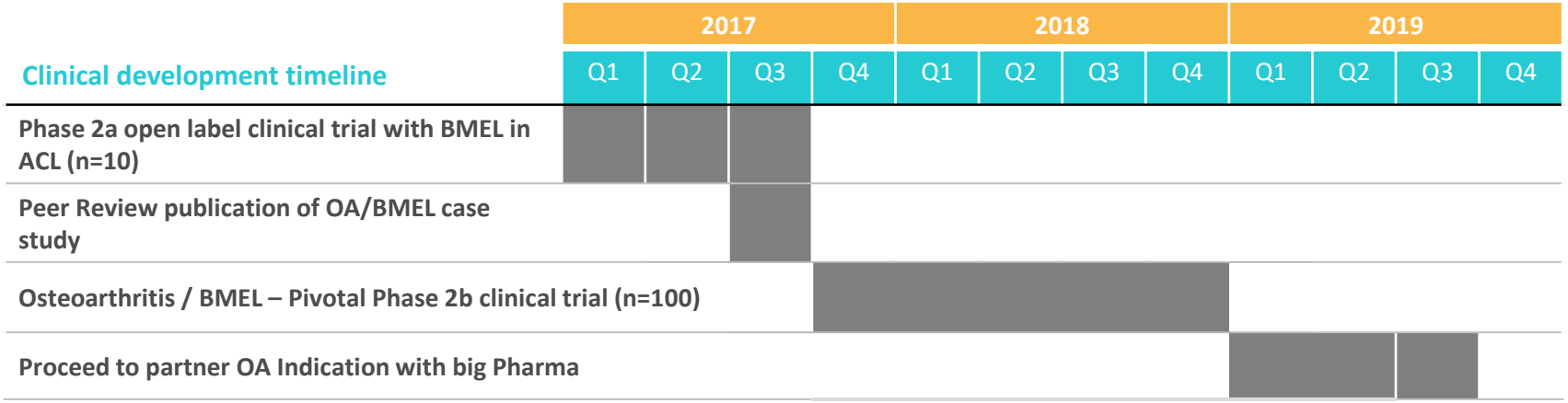
	paradigm (ZILOSUL®)	NSAID (ibuprofen etc)	Opioid (oxycodone etc)	Corticosteroid / Cortisone	Joint Replacement
Treats the symptoms of OA (pain & function)	✓	✓	✓	✓	✓
Treats underlying pathology	✓				✓
No undesirable side-effects	✓				
Non-addictive	✓	✓		✓	✓
Anti-inflammatory	✓	✓		✓	
Non-Surgical	✓	✓	✓	✓	

1. https://www.drugabuse.gov/news-events/news-releases/2017/07/pain-relief-most-reported-reason-misuse-opioid-pain-relievers

OA with BML: Clinical Timeline

Comprehensive clinical pathway to commercialisation

- **OA/BMEL case study published in peer reviewed scientific journal**
- **Successful completion of the Phase 2a open label clinical trial**
  - Trial demonstrated the safety, tolerability and efficacy of ZILOSUL® in patients with a bone marrow edema lesions from a recent ACL (acute knee) injury
- **45 additional patients treated under the TGA SAS scheme. Very positive clinical signals from BML patients with osteoarthritis (OA)**
- **Over 50% recruited for Phase 2b placebo controlled (100 patient) clinical trial for BML with OA – Results due Q4 CY2018**
- **Plan to undertake pilot studies in BML patients with rheumatoid arthritis (RA)**



Note:
1. Closed label, randomised, double blind, placebo controlled trial expected to commence in Q42017, expected to be completed in 12-18 months after commencement

Viral Arthritis – Alphavirus

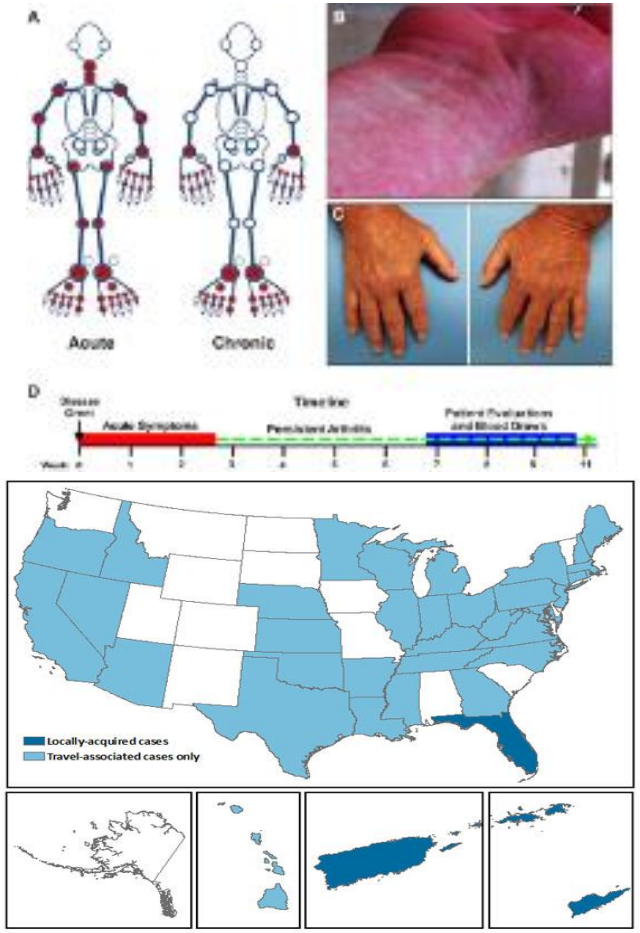
No approved treatment for severely debilitating viral infection

Viral Arthritis

- Alphavirus infections result in the clinical symptoms of joint and muscle pain, fever and joint inflammation.
- Ross River Virus (RRV) and Chikungunya (CHIKV) are mosquito-transmitted arthritogenic alpha viruses that cause epidemics of severe musculoskeletal disease in many countries.
- No effective treatment, with sufferers left incapacitated
- Symptoms can persist for a number of years

Ross River Virus & Chikungunya Virus

- Paradigm acquired the patent from the Institute for Glycomics research at Griffith University.
- The patent claims the use of PPS to treat alphaviruses, including Ross River Virus (RRV) and Chikungunya Virus (CHIKV).
- Potential interest from the **US Department of Defense** to co-develop for treating CHIKV

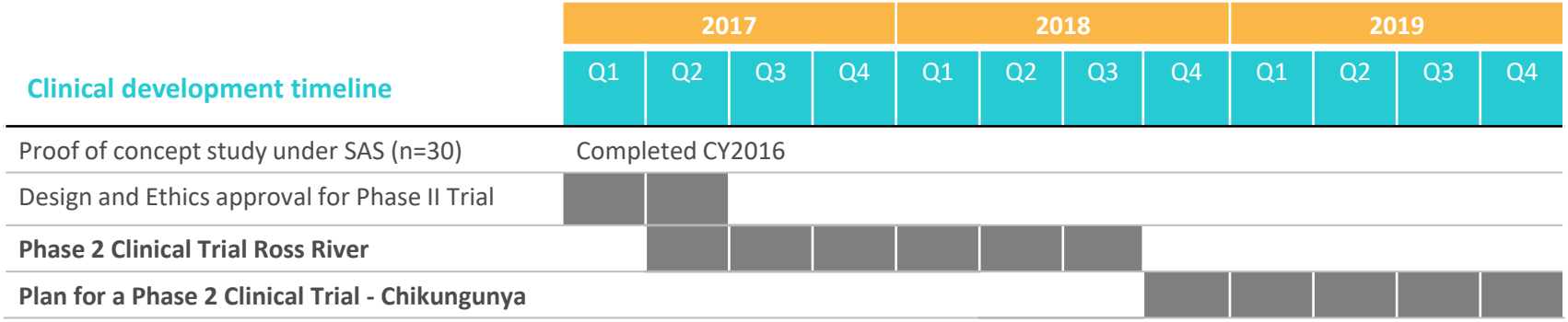


Chikungunya cases ,USA

Viral Arthritis: Clinical Timeline

Potential to gain Orphan status, resulting in fast-tracked clinical development

- **Pre-clinical studies have been conducted by the Institute of Glycomics at Griffith University. The results suggested that:**
  - PPS significantly alleviated the severity of disease and reduced both the inflammatory response and the loss of articular cartilage;
  - PPS has the potential to treat both acute and chronic symptoms associated with mosquito transmitted alphavirus infections (Ross River virus (RRV) and chikungunya virus (CHIKV);
  - There currently is no effective disease modifying treatment for RRV or CHIKV.
- 30 patients with RRV-arthralgia (joint pain) already treated with PPS under the TGA Special Access Scheme demonstrating tolerability and potential clinical effects
- **Phase 2 Clinical Trial – PPS to treat RRV and CHIKV**
  - Queensland Government have provided a A$300,000 grant for Ross River research –
  - Paradigm to embark on two Phase 2 clinical trial to develop PPS for the treatment of RRV-and CHIKV-induced arthritis and arthralgia – **Potential for Fast-Track /Breakthrough/Accelerated Approval**



Broad Product Pipeline

Drug Candidate	Indication(s)	Preclinical	SAS Pilot/Phase 1	Phase 2	Milestones (next 12 months)
Orthopaedic - Bone Marrow Edema/Lesions (Bone Bruising)					
PPS	BME with acute injuries (ACL etc)			~10 ACL Patients	ACL-BME Phase 2a results read out
	BME with Osteoarthritis (OA) - placebo controlled			100 OA patients	50% Recruited - Read out Q4 CY2018
	BME with Osteoarthritis (OA) - RWE Open Label		45 OA patients Open Label/RWE		Data gathered from TGA SAS patients
Viral Arthritis – Alphavirus					
PPS	Ross River Virus (RRv)		30 SAS RRv Patients	24 RRv Patients	70% Recruited - Read out Q3 CY2018
	Chikungunya virus (CHIKV)				Enter Phase 2 + other pilot studies
Respiratory					
PPS	allergic rhinitis (hay fever)		20 Phase 1 safety	40x2 patient crossover	Analyse trial data and reformulate
	Chronic Obstructive Pulmonary Disease (COPD)				Develop formulation & partner
	allergic asthma				Develop formulation & partner
Cardiovascular					
PPS	heart failure				Conduct 24 person placebo controlled Phase 1/2
Inflammation & autoimmune					
Novel Anti IL-1 RA inhibitor peptide	auto-immune disorders (IBD, Crohns' disease, GVHD), oncology, complications from cytotoxic drugs (mucositis) and cancer cachexia		26 patients phase 1/2		Reformulate into oral compound Finalise data pack & partner or progress human clinical trials

Clinical Pipeline

Paradigm hosts a deep clinical pipeline

	Indication(s)	Clinical Status	Market Size
IL-1RA Peptide	▪ Inflammatory bowel disease ("**IBD**") ▪ Cancer-related cachexia ▪ Ulcerative colitis ▪ Crohn's disease	Safety and efficacy confirmed in Phase 1/2 clinical trial (n:26)	Inflammatory Bowel Disease Medicines predicted to reach **US$9.3 Billion**[1]
Cardiovascular	▪ Heat Failure	Demonstrated beneficial effects in an established preclinical heart failure model	**US$18+ Billion**[2]
Respiratory	▪ Hay Fever ▪ COPD ▪ Allergic Asthma	▪ Pre-clinical safety and efficacy in guinea pig model ▪ Safety confirmed in Phase 1b clinical trial (n:18) ▪ Paradigm to reassess Phase 2b clinical trial (n:40)	**US$11+ Billion**

IP Protection

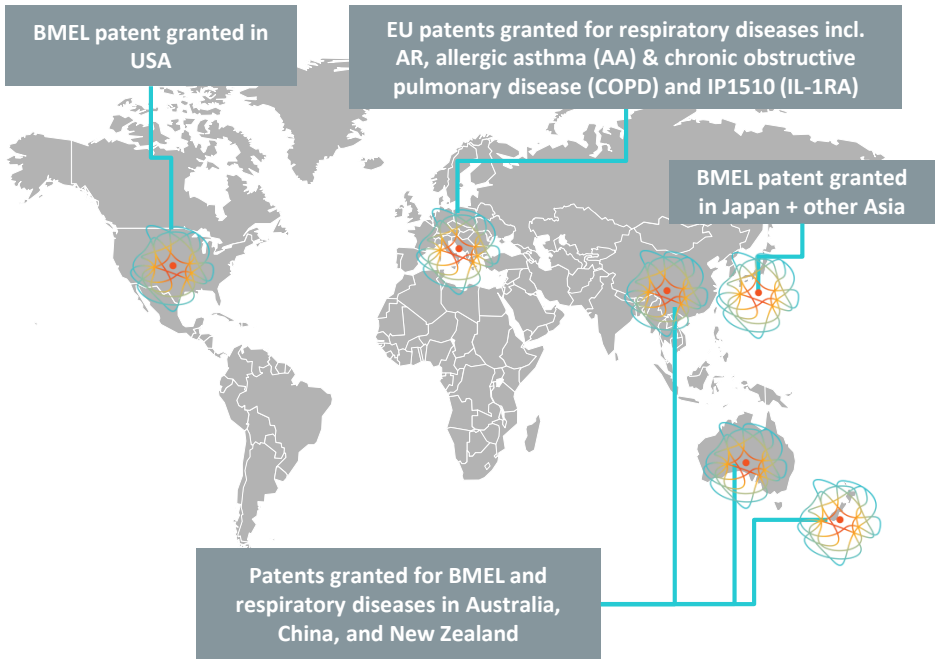
Multi-faceted IP protection increases barriers to entry for potential competitors

Valuable patent portfolio

- Paradigm has patent protection because it is using PPS for new indications
- Minimum life on patents is 2030 and beyond for more recent patents - i.e. 2035
- Patents granted for specific indications
- Established regulatory exclusivity and trademarks
- Patent applications for Ross River virus and Chikungunya virus
- Global patent for Heart Failure indication
- Assessing additional patent applications

Secure manufacturing and supply

- Exclusive 20 year supply agreement with bene PharmaChem[1]
- bene pharmaChem makes the only FDA-approved form of PPS
- Manufacturing methods are a well kept trade secret
- Reduces risks associated with manufacturing and supply



Note:

1. bene pharmaChem is a private company located in Germany and manufactures the only officially approved and clinically tested medicinal PPS in the USA, Europe and Australia

Peer Comparison

Attractive investment given low risk development and large market opportunity

- Paradigm appears undervalued compared to similar stage, drug repurposing peers given its platform for successful development, secure industrial scale manufacturing and the size of its addressable markets

Peer	Ticker and exchange	Market cap (A$m)	Rationale	Clinical stage of key product	Addressable market size
Medical Developments International	MVP.ASX	428	Developing new markets and applications for Penthrox, recent focus on respiratory diseases, significant manufacturing IP	Commercialisation	US$1.5bn+
starpharma	SPL.ASX	444	Commercialising an old technology of synthetic branching polymers (dendrimers), with lead product VivaGel in Phase III trials	Phase III & commercialisation	US$3bn+
AXSOME THERAPEUTICS	AXSM.NASDAQ	83	Developing novel therapies for the management of central nervous system disorders, focusing on treatment of BMEL	Phase III	US$2.5bn+[2]
verona pharma	VRP.LN	285	Focused on commercialising an old compound for respiratory diseases, with dual inhibition of key enzymes	Phase I/II(a)	US$12bn+[3]
paradigm BIOPHARMA	PAR.ASX	34	Focused on the clinical development of PPS as a multi-target treatment for complex conditions, such as BMEL/OA, AV & AR	Multiple Phase II(a)	US$37bn+[4]

Source: Bloomberg, company filings

1. Market data as at 20 March 2018, exchange rates of AUDGBP 0.55 and AUDUSD 0.77
2. Based on BMEL addressable market size, excludes CRPS addressable market due to lack of available information and thus likely understates true market size
3. Only includes the market size for COPD which is US$12b+, excludes market sizes for other respiratory disease indications
4. Includes AR market US$11bn+ and OA/BMEL market US$8bn+ & $0.5bn for viral arthritis ,excludes COPD addressable market size of US$12bn+ and Asthma addressable market size of US$15bn+ and Heart failure Figures between 2014 & 2016 - Statins $13.2bn (Research and Markets - Global Statin Market 2015-2016), Clopidogrel bisulphate $1.8bn, Beta-blockers $1.55bn, Ace inhibitors 0.47bn, Aspirin $0.54bn, Vitamin K antagonist $0.5bn (www.pharmacompass.com)

Share Price Catalysts

Upcoming milestones should drive strong shareholder returns

ACL/BMEL **OA/BMEL** *Phase 2 trials*	▪ Additional OA with BML RWE results ▪ Complete Phase 2b placebo controlled OA clinical trial (100 patients) with **trial results Read Out targeted for end CY2018** ▪ Additional high Profile sporting identities (such as Andrew Walker, Carlton) treated with PPS under SAS program
ALPHAVIRUSES *Phase 2 Trials*	▪ Completion of RRv Phase 2a clinical trial (24 patients) – **Results Read Out Q3 CY2018** ▪ Potential to partner with US DoD on CHIKV treatments and trials ▪ Initiation of CHIKV Phase 2a clinical trial
IL-1RA Peptide *Auto-immune, oncology cancer cachexia*	▪ Reformulation into oral administration ▪ Partner with big Pharma ▪ Progress pilot human clinical trials (TBD)
HAY FEVER	▪ Analysis of Phase 2 results and determine reformulation ▪ Explore formulations for COPD and Allergic Asthma ▪ Potential to JV or co-fund future development
CORPORATE OPPORTUNITIES *Potential partners*	▪ Demonstrated interest from major pharmaceuticals companies in treatments for OA, BMEL, Respiratory, Heart Failure and Alpha Virus' & IL-1 RA peptide ▪ Partnership with world-class manufacturers
EXPANSION *Market share*	▪ Expansion of BMEL market into OA and other joint pain indications ▪ Progress and potentially partner IL-1RA peptide ▪ Progress Alphavirus and Heart Failure ▪ Develop new IP and corporate opportunities in new indications

Contacts

Office

Level 2, 517 Flinders Lane,
Melbourne, VIC, 3000
info@paradigmbiopharma.com

Managing Director & CEO

Paul Rennie - prennie@paradigmbiopharma.com

Chief Scientific Officer

Dr Ravi Krishnan – rkrishnan@paradigmbiopharma.com

Corporate Advisor

Baker Young Stockbrokers Ltd

Dirk van Dissel – dvandissel@bakeryoung.com.au

Analyst

Baker Young Stockbrokers Ltd

Alastair Murray – amurray@bakeryoung.com.au