

# Developing the world's first Ovarian Cancer Therapy Vaccine

JP Morgan Healthcare Conference - January 2011





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# About Prima Biomed

Prima BioMed (ASX:PRR) is a biotechnology company focused on **cancer immunotherapy**, which stimulates the body's own immune system to attack tumors.



Its lead product is the **CVac™ ovarian cancer immune therapeutic or known as therapeutic cancer vaccine** - a maintenance therapy for patients with ovarian cancer administered post-surgery and post-chemotherapy to delay relapse and control metastases.

Prima's **extensive intellectual property portfolio** originates from the Austin Research Institute, Melbourne, Australia. The Company's **strategy is to commercialize CVac™ into the multi-billion dollar global oncology therapeutic market**

Other products in the development pipeline

- Oral HPV vaccine created using dense gas technology
- Humanized monoclonal antibody targeting Cripto-1



# Executive Leadership

- Mr Martin Rogers, CEO
- Dr Neil Frazer, CMO
  - Former Glaxo, 25 years drug development experience including 10 FDA approvals
- Mrs Ginny Raymond, Clinical Affairs
  - Former Pfizer director of Global Medical
- Dr Sharron Gargosky, SVP CVac™ Program
  - 3 previous successful Orphan Drug approvals with FDA
- Mr Matthew Lehman, COO
  - Over 100 clinical trials experience in execution

# CVac™ - Lead Program



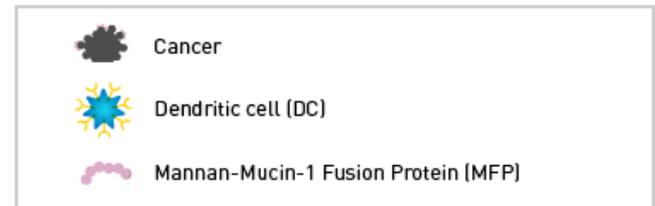
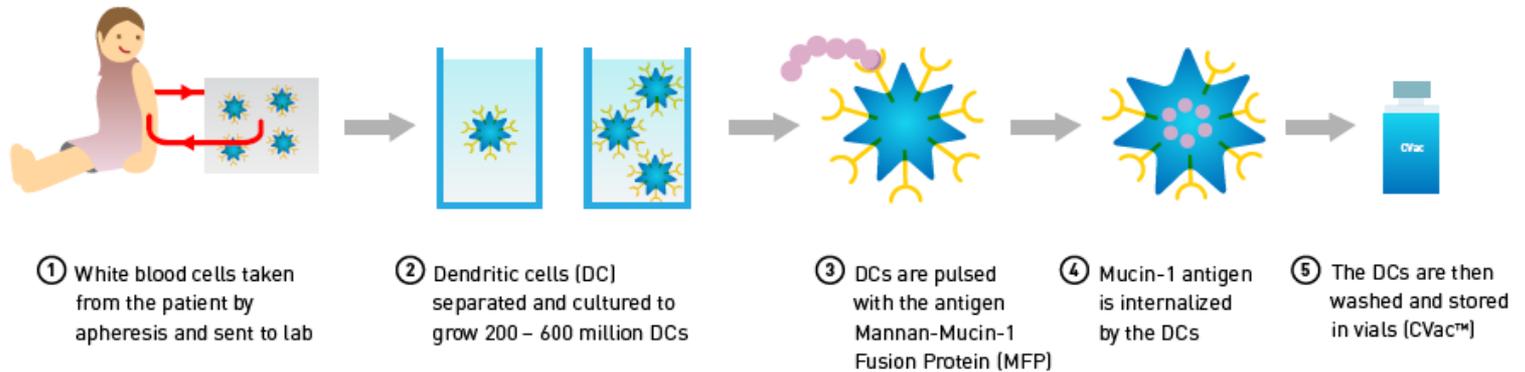
- CVac™ is an autologous, dendritic-cell (DC) based therapy or cancer vaccine similar to Dendreon's Provenge™
- CVac™ currently in the clinic with a third trial ongoing
- Results from phase I and phase IIa trials were very promising
- Ongoing phase IIb and upcoming registration trials will provide further proof of concept for global registration
- CVac™ is also been evaluated for a registration study in breast cancer
- CVac™ successful results will see Prima BioMed capture significant share of the multibillion dollar cancer vaccine market





# How CVac™ Works

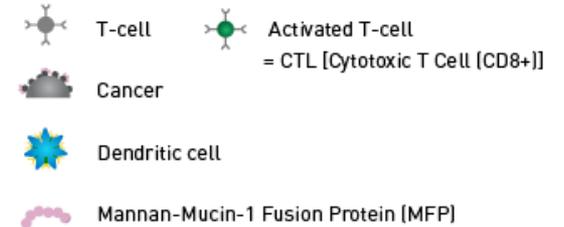
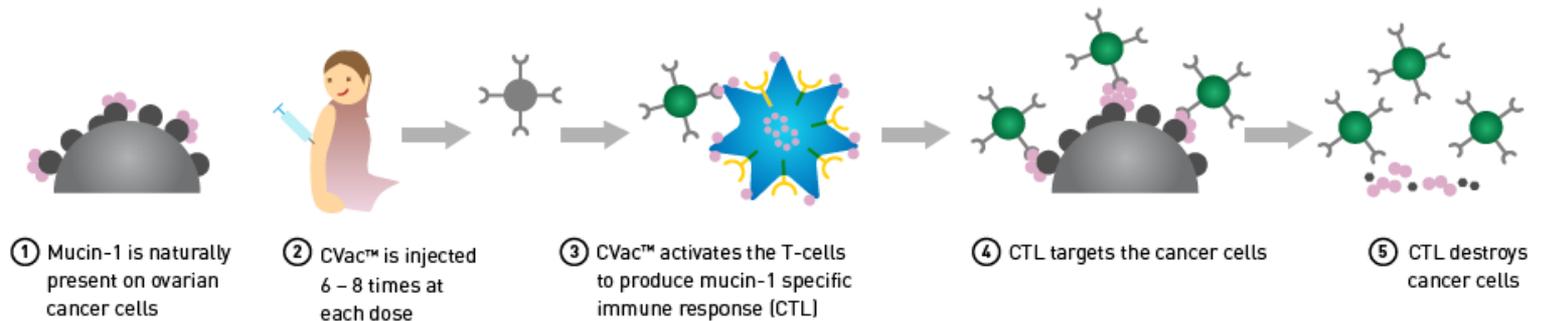
## Manufacturing of CVac





# How CVac™ Works

## Mechanism after injection





# Demand for CVac™

- The global market size for ovarian cancer is estimated to grow to **US\$3.6b by 2010**
- Each year **73,000 women** are diagnosed with ovarian cancer in the US, Europe, Australia and Japan. **318,000 globally**
- Since ovarian cancer is generally diagnosed at a late stage, only 20-30% of patients with late stage disease survive for 5 years
- A maintenance style treatment like CVac™ would be the first of its type in the market and would initially aim to take a conservative 10-25% of this ovarian cancer treatment market





# Demand for CVac™

- Median progression free survival (median) after optimal surgery and chemotherapy is only 22 months
  - Non-toxic nature of CVac™ creates a “no-brainer” for the oncologist
  - **A conservative 10% market share equates to approximately US\$360m p.a.**
  - **Wall St analysts of Dendreon Corporation suggest market size could be greater than US\$1.5Bn per indication**
  - CVac™ also has potential indications in several additional cancers
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# CVac™ - Lead Program



- CVac™ is a potential game changer for treatment of tumors that over-express mucin-1
- Ovarian cancer, the first target, has the highest mortality of all gynecological cancers
- Front-line treatment has not changed in over a decade
- CVac™ is also being evaluated for a registration study in breast cancer
- CVac™ has the potential to alter the treatment paradigm by prolonging periods of ovarian cancer remission with very low toxicity potential



# Value Drivers – Key Prima Biomed Attributes

- ✓ CVac™ addresses a major global unmet medical need
- ✓ Depth and experience in management for drug approval
- ✓ Global ovarian cancer treatment market estimated to be worth US\$3.6b in 2010
- ✓ Investigational New Drug (IND) application open with US FDA
- ✓ Phase IIb study started early 2010



# Value Drivers – Key Program Attributes

- ✓ Phase IIb trial leadership from prestigious Fred Hutchinson Cancer Centre in Seattle in the USA
- ✓ **Progressing rapidly to commercialisation of world's first ovarian cancer vaccine, CVac™**
- ✓ Pursuing fast-track commercialisation in other jurisdictions outside US FDA
- ✓ Registration study to be conducted in Europe, commencing recruitment by Q3 2011
- ✓ Full Patient Recruitment for the registration study expected in 2012
- ✓ Breast Cancer study for CVac™ to commence Q4 2011



# Value Drivers – Key Program Attributes

- ✓ World class scientific advisory team including Prof Ian Frazer, co-inventor of Merck/CSL's cervical cancer vaccine, Gardasil™
- ✓ Experienced pharmaceutical sector expert Dr Neil Frazer appointed Chief Medical Officer to oversee CVac™ clinical trials
- ✓ Company to also develop an oral delivery system for cervical cancer vaccine
- ✓ Company well funded; **\$40M committed for current work**





# CVac™ - Phase IIb Design

- Phase I and IIa trials indicate CVac™ is a strong candidate for treatment of ovarian cancer patients in remission and for other MUC-1 over-expressing tumors.
- Phase IIb trial (60 patients) for ovarian cancer patients after successful 1<sup>st</sup> or 2<sup>nd</sup> line therapy is recruiting patients in USA and Australia:
  - Assure comparability of multiple manufacturing centers
  - Confirm safety and tolerability established in earlier trials
  - Compare CVac™ to observation in terms of progression-free survival (PFS)
  - Evaluate host immunologic response to Cvac™ administration





# CVac™ - Registration Study design

- Registration trial for ovarian cancer patients in remission planned to commence by 3<sup>rd</sup> Quarter 2011 (Europe, USA, Australia):
  - Randomized, well-designed efficacy trial
  - Definitively establish survival benefit – overall survival (OS) and PFS
  - Assess quality of life and pharmacoeconomic parameters
  - Intended to support marketing authorizations in US, EU and other world markets





# Clinical Evidence Demonstrates Disease Modification

- **Phase Ib - CVac™**
  - 14 patients with terminal cancer (3-6mths life expectancy), broad range of adenocarcinomas including renal, breast, ovarian, fallopian tube, colon, lung and oesophageal
  - Objectives:
    - Primary: assess toxicity
    - Secondary: assess anti-tumor efficacy, immune response and procedure feasibility





# Clinical Evidence Demonstrates Disease Modification

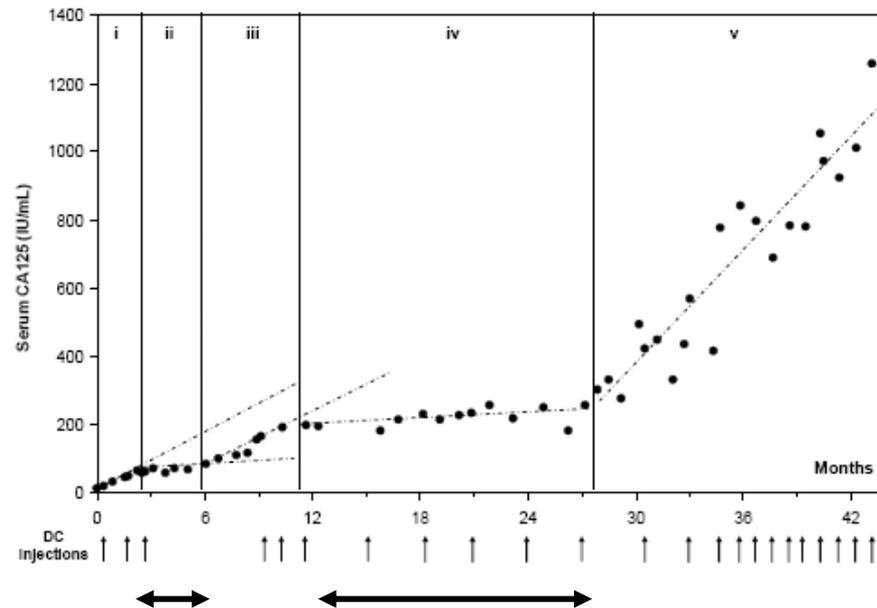
- Results:
  - No treatment related toxicity
  - All patients produced desired cellular immune response
  - Patient's cells were successfully cryopreserved
  - Four patients – disease remained stable over assessment period
  - Two patients received ongoing therapy for >40mths



# Why target Ovarian cancer?

## Stage III ovarian cancer patient

- Incurable recurrent disease, diagnosed by elevated CA125 marker
- CVac™ treatment demonstrates stabilization of CA125, initially for 4mths, then for a further 18mths post further injections of CVac™



Stable disease

4mths

18mths

# Phase IIa Trial Demonstrates Disease Modification



**CVac™ results – 21% of patients responded to therapy**

- Enrolled 28 patients (21 evaluable), incurable ovarian cancer (life expectancy at least 6 months), rising CA125 levels defined as at least 25% over baseline within one month
- Objective:
  - **Primary:**  
CA125 response or stabilization in at least 15% patients
  - **Secondary:**  
Disease progression-free survival, immune response and safety

# Phase IIa Trial Demonstrates Disease Modification

**CVac™ results – 21% of patients responded to therapy**

- **Protocol:**
  - Patients receive 3 injections of CVac™ over a ten week period, followed by 4 injections at 10 week intervals
- **Indication of disease intervention:**
  - No therapy-related toxicity
  - CA125 responds to therapy, with disease response/stabilisation
  - Progression Free Survival Average 127 days (95% confidence limits 96 to 219 days).



# Comparable Oncology Disease Trials

## Phase IIa disease intervention trials, response rates

- On completion of Phase IIa disease intervention trials of the following drugs (some of which are now FDA approved drugs) these results were reported
  - **Ovarian cancer**
    - Avastin (VEGF-A MAb):  
Phase II = 16% showed disease modification
    - (sales = >US\$ 1.2bn – colon cancer)
    - Aromasin (anti-estrogen):  
Phase II = 36% stable disease

# Comparable Oncology Disease Trials

## Phase IIa disease intervention trials, response rates

### – Other

- Iressa and Tarceva (EGFR inhibitors): Phase II = 10-20% showed decrease in disease marker (sales = >US\$1bn – NSC Lung Cancer)
- Provenge (PAP-GM-CSF autologous cell): Phase II = 19% decrease in disease markers (FDA approval – 1 May 2010)
- CVac™ results – 21% of patients responded to therapy
- 47% of patients had disease stabilisation – key driver to patient quality of life



# Clinical Leader Opinions

Further commentary is available from key opinion leaders

- Dr. Jonathan Berek, MD
  - Stanford Medical Centre, Head of Women's Cancer Centre
- Prof. Ian Frazer, MD
  - University of Queensland, Diamantina Centre for Immunology
- Dr. Heidi Gray, MD
  - Fred Hutchinson Cancer Centre, University of Washington



# Clinical Leader Opinions

- *“These results indicate the potential of dendritic cell therapy and the CVac™ approach to harness the immune system to intervene in tumour growth, even in patients with advanced disease. In addition, the targeting of Mucin-1 is again validated for cancer therapies.”*

Prof Bruce Loveland, Burnet Cancer Research Centre

- 
- *“Despite the advanced stage of disease this new product candidate CVac™ clearly showed benefit in a statistically significant number of these patients.”*

Principal Investigator, Prof Paul Mitchell, Director Cancer Services, Austin Hospital

# Anti-Cripto-1 Mab

- Prima has raised various murine and human monoclonal antibodies (Mabs) recognizing the EGF-CFC family member named Cripto-1.
- Human Cripto is a  $M_r$  36,000 molecule, classified in the epidermal growth factor-Cripto-FRL-Criptic (EGF-CFC) family; Cripto is also an oncogenic growth factor that is involved in tumorigenesis and cancer cell proliferation.
- The Mabs inhibit tumor growth *in vitro* of most cancers of the breast, colon, lung, stomach and pancreas but do not or weakly react with normal tissues. The effects were greater in the presence of cytotoxic drugs such as 5-fluorouracil, epirubicin, and cisplatin.



# Anti-Cripto-1 Mab

- The anti-Cripto mAbs prevent tumor development *in vivo* and inhibit the growth of established tumors of LS174T colon xenografts in SCID mice. However most of the evidence was obtained with antibodies of the IgM isotype.

## Plan of Action:

1. Establish proof of concept with humanized Anti-Cripto-1 Mab – 3Q 2011
2. Preclinical studies to support an IND and human trials – 1Q 2013

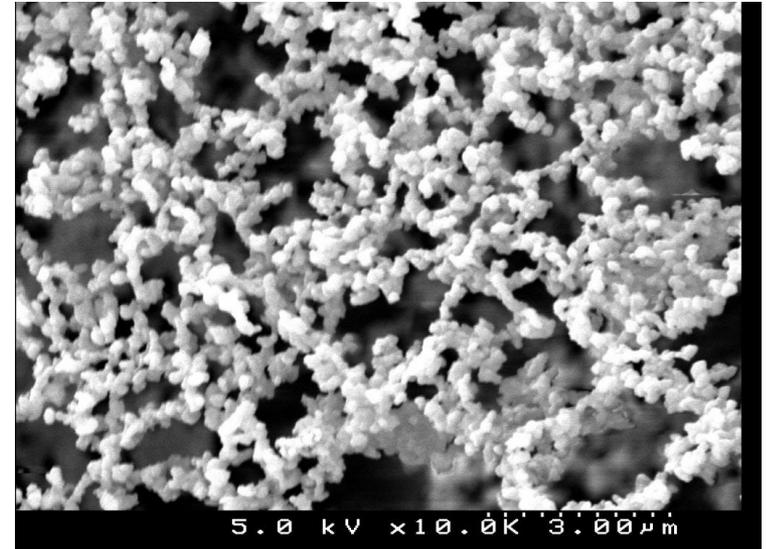
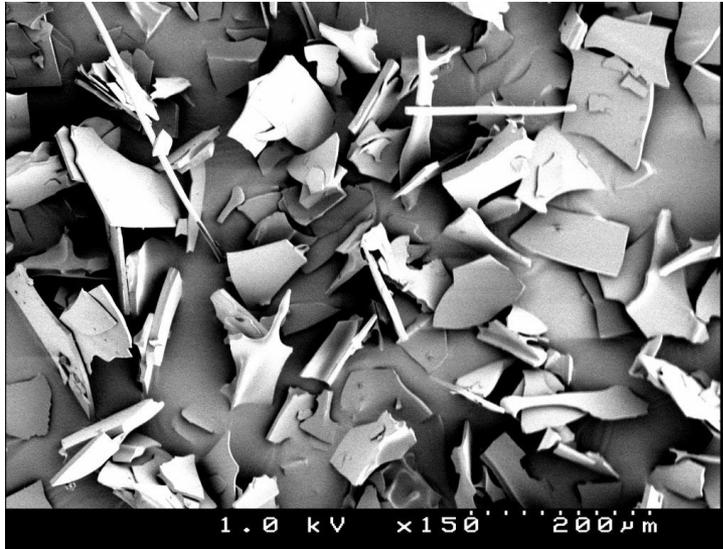


# Oral HPV Vaccine

- Prima has partnered with Prof. Ian Frazer and Prof. Neil Foster to use **dense gas** technology for the formulation of an oral HPV vaccine
- The technology reformulates large, irregular particles into smaller, consistent sizes, allowing for higher bioavailability at lower doses of a drug and encapsulation for oral dosing
- Studies with Eudragit® coated lysozyme completed and feasibility studies with ovalbumin are ongoing



# Oral HPV Vaccine



Using dense gas technology (lysozyme framework) reduced the particle size seventy-fold and produced a much more regular shape.



# Newsflow

- NASDAQ listing
- Potency assay qualified Q1 2011
- CAN-003 randomized phase Feb 2011
- European license for Manufacturing Q1-Q2 2011
- Registration study recruitment commencement June 2011
- FDA meeting for registration study review Q3 2011
- Completion of CAN-003 phase IIb recruitment June 2011
- Cripto 1 mAB feasibility Q2 2011
- Oral HPV vaccine initial data Q2 2011



# Conclusions

- CVac™ has the potential to transform the treatment of mucin-1 over-expressing tumours. Eg. Ovarian, breast, colorectal, lung etc.
- Trials are designed for core approval pathways with FDA, Australia and Europe
- Top tier scientific advisors and project managers – track record of successful commercialization

# Conclusions

- Solid financial position
- Marketing approval in other jurisdictions to be sought
- Pipeline of other cancer treatment technologies
- Success will provide considerable investment return over the next 2-3 years.

# Corporate Snapshot

## Issued Capital

ASX Code: PRR (Australian Stock Exchange)

Shares: 755.1M

Listed Options: 112.4M (exercise price \$0.02 on or before 31 Dec 2011)

**Total Issued Securities:853.8M**

## Price & Capitalisation

Share Price: 20c ( 4 Jan 2011)

Mkt. Cap(diluted) **\$173.5M**

Cash Position: **\$14.7M(25/10/10) + \$700k monthly converting note at 10% discount to 5 day VWAP**

## Board of Directors

Ms Lucy Turnbull

Chairman

Mr Albert Wong

Deputy Chair

Mr Martin Rogers

Chief Executive Officer

Dr Neil Frazer

Chief Medical Officer

Dr Richard Hammel

Non-Executive Director

# Contact

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