

## About Starpharma

- ASX300 company (ASX:SPL)
- Two core business areas: DEP® drug delivery platform and VivaGel® supporting a deep portfolio of products under development or on market
- DEP® drug delivery platform has the potential to produce a portfolio of new DEP® products with multiple revenue streams
- Multi product DEP® license with AstraZeneca valued up to US\$126M in milestones plus royalties (first product) and up to US\$93M plus royalties for subsequent products
- DEP® docetaxel and internal DEP® pipeline has potential to deliver multiple and high value additional deals
- DEP® based partnered programs in place and under discussion with multiple leading pharmaceutical companies

## Starpharma's DEP® platform: polylysine dendrimers

Starpharma's novel dendrimer-based DEP® platform has broad commercial applicability in drug delivery by enhancing the therapeutic utility of drugs through improved solubility, efficacy and pharmacokinetics, reductions in certain toxicities (e.g. bone marrow toxicity) and creating a unique intellectual property position. The novel DEP platform has shown reproducible advantages across a wide range of drug classes and can be utilised with both small molecule drugs, peptides and proteins.

### DEP® BENEFITS

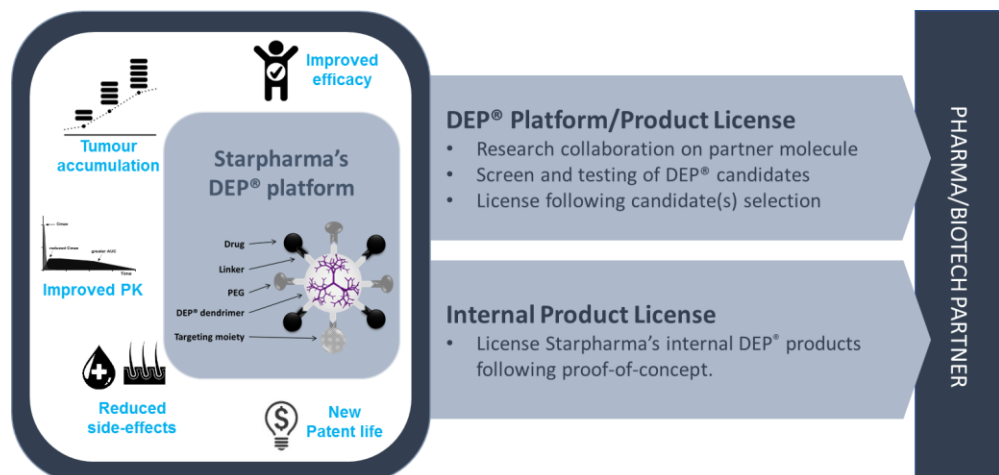
- Improved efficacy and safety\*
- Improved solubility
- Improved pharmacokinetics
- Patent life extension
- Benefit in combination with marketed anti-cancer therapies
- Broad applicability (drugs/therapy areas)

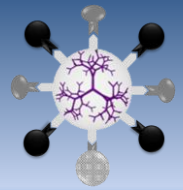


\* Multiple preclinical studies have established improved efficacy, survival and safety with DEP®

### PARTNERING STRATEGY

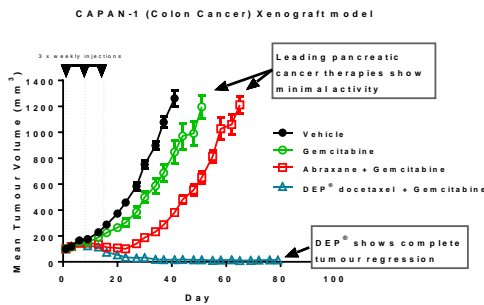
Starpharma is actively seeking partners for its DEP® drug delivery platform, and to combine partners' proprietary oncology agents with DEP® therapeutics.





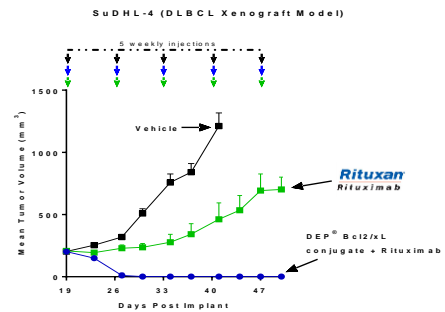
## DEP<sup>®</sup> PRODUCTS IN COMBINATION THERAPY

Combination therapies are widely regarded as the future of oncology. Starpharma continues to add value to its DEP<sup>®</sup> portfolio through exploring its DEP<sup>®</sup> products in combination with other oncology agents.



Gemcitabine is frequently used alone and in combination with Abraxane<sup>®</sup> in pancreatic cancer as a first line drug treatment. Pancreatic cancer is a leading cause of cancer death, with a 1-yr survival rate of 20% and a 5-yr survival of only 7%.

DEP<sup>®</sup> docetaxel and DEP<sup>®</sup> cabazitaxel both recently showed significant efficacy and safety benefits over gemcitabine (Gemzar<sup>®</sup>) alone, Abraxane<sup>®</sup> (Nab-paclitaxel) alone and in combination, in a human pancreatic cancer model. (Note: Graph above shows data for DEP<sup>®</sup> docetaxel versus Abraxane and Gemcitabine. A Similar profile to DEP docetaxel was also seen with DEP<sup>®</sup> cabazitaxel).



Starpharma's partnership with AstraZeneca includes a multiproduct DEP<sup>®</sup> licence which currently involves the development and commercialisation of two novel AstraZeneca oncology compounds with potential to add more.

AstraZeneca has described its first DEP<sup>®</sup> product, AZD0466 (a Bcl2/xL inhibitor), as a potentially best-in-class drug with a broad combination opportunity in solid and haematological tumours.

AstraZeneca DEP<sup>®</sup> Bcl2/xL inhibitor conjugates were significantly more efficacious than the Bcl2/xL inhibitor alone, and in combination with Rituximab, resulting in complete tumour regression in most animals

### EXPLORING DEP<sup>®</sup> THERAPEUTICS IN COMBINATION WITH IMMUNOONCOLOGY AGENTS

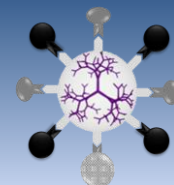
ImmunoOncology (IO) therapies have the potential to revolutionise cancer treatment regimens. In order to further improve clinical response rates, novel combination treatments are sought to achieve additive or synergistic activity.

Starpharma's internal DEP<sup>®</sup> drugs are ideal candidates for combination therapy with IO agents.

- Successful immunotherapy requires a fully functional immune response
  - Unlike standard chemotherapy drugs which may cause immunosuppression, DEP<sup>®</sup> drugs do not cause myelosuppression
  - In a phase I study, DEP<sup>®</sup> docetaxel caused no neutropenia (compared to >90% with Taxotere<sup>®</sup>)
- Many chemotherapy drugs require immunosuppressive steroid pre-treatment due to formulations containing detergent (e.g. polysorbate 80)
  - DEP<sup>®</sup> products are water soluble with formulations not requiring polysorbate 80, therefore patients do not require steroid pre-treatment

**Starpharma is seeking partners to test their proprietary IO agents with DEP<sup>®</sup> therapeutics.**

# Starpharma – DEP® drug delivery



## TARGETED DEP® CONJUGATES

Starpharma's targeted DEP® conjugates provide many benefits over existing ADCs and can overcome many issues faced today by existing ADC approaches including;

- Greater homogeneity
- Site specific attachment of drug conjugate
- Reduced/no aggregation
- Attachment of multiple drug loaded dendrimers
- delivery of significantly higher payload levels than conventional ADCs – higher drug antibody ratios (DARs)

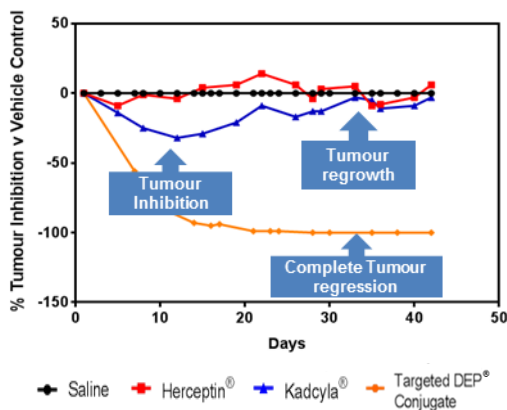
## Anti-HER-2 Targeted DEP® conjugates

Starpharma's novel Targeted DEP® conjugate resulted in complete tumour regression and 100% survival

- 100% of mice treated with Starpharma's HER2-targeted DEP® conjugate were tumour-free within three weeks of the commencement of treatment and remained that way for the total duration of the study.

In contrast, only tumour stasis was observed during treatment in the Kadcyła® group

- with a maximum tumour volume inhibition of 32% and tumour regrowth occurring soon after the completion of dosing.



SKOV-3 Ovarian cancer xenograft in NOD-SCID mice

- Saline, Kadcyła® (10mg/kg) and Targeted DEP® conjugate were dosed once/wk for 3 wks; Herceptin® (20mg/kg) dosed twice/wk for 3 wks; N= 5-6/group
- Statistical analysis at day 40. Kadcyła® vs Targeted DEP®; P <0.0001 (ANOVA followed by Tukey's post hoc test).

Diagrammatic representation of an Antibody targeted DEP® conjugate (not to scale)

### Targeting

- Flexibility in use of targeting molecule
  - Ab; Ab fragment; Non-Ab ligand; Small molecule

### DEP® drug conjugate

- Precisely manufactured poly-lysine dendrimer with attached drug/payload
- Dendrimer size easily scalable to deliver desired payload number (8, 16, 32...) per dendrimer conjugate
- Can deliver any type of payload – cytotoxic/ultracotoxic or radiotherapeutic
- Drug-linker strategy easily tailored to meet drug release requirements

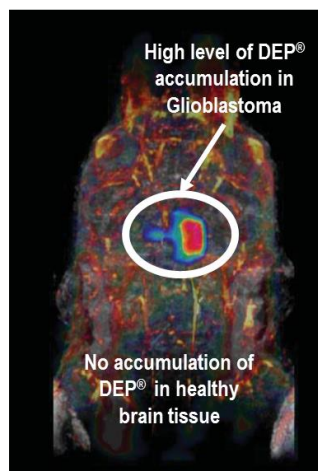
### Site specific attachment

- Precise and reproducible
- Attach multiple dendrimers of differing size - high Drug Antibody Ratio (DAR)
- Achieve significantly higher DAR than other approaches

## DEP® RADIOTHERAPEUTIC

Through the EPR (Enhanced Permeability and Retention) effect, DEP® conjugates pass through the “leaky” vasculature in tumours and accumulate in these sites more than in normal tissues (e.g. DEP® docetaxel up to 70x more than Taxotere).

**Delivering radiotherapy in a targeted way:** Targeted delivery of radiotherapeutic DEP® conjugates has the potential to minimise off target toxicity and enhance efficacy when used alone or in combination with other therapeutic approaches. Additionally provides opportunities for co-development of therapeutic and diagnostic products.

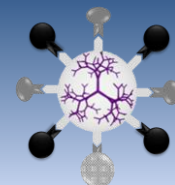


*PET-MR image of GBM-bearing mouse 5 days post-injection of radiolabelled DEP® conjugate*



*DEP® conjugate accumulates in the tumour of a mouse DU145 (human prostate cancer) xenograft 48 hours following injection, via the EPR effect.*

# Starpharma – DEP® drug delivery



## STARPHARMA INTERNAL DEP® PRODUCTS

**DEP® DOCETAXEL** – a patented, detergent-free, enhanced version of the widely used anti-cancer drug Taxotere®, which had peak sales of US\$3B. A phase 2 program focusing on lung cancer and prostate cancer is currently underway. Early efficacy signals have been observed in a number of patients including stable disease, tumour shrinkage and a notable lack of bone marrow toxicity and other common side effects.

**DEP® CABAZITAXEL** – a patented, detergent-free, version of leading cancer drug Jevtana®. Two UK sites are currently recruiting patients for the phase 1 / 2 trial. Consistent with DEP® docetaxel, early efficacy signals have been observed in the trial.

**DEP® IRINOTECAN** – an improved version of irinotecan, which is widely used for colon cancer. A phase 1 / 2 trial is expected to commence in the first half of 2019. The trial will be open to patients with colon cancer and pancreatic cancer.



## Contacts

### Licensing and Partnerships

[busdev@starpharma.com](mailto:busdev@starpharma.com)

Starpharma Pty Limited  
4-6 Southampton Crescent,  
Abbotsford  
VIC 3067  
AUSTRALIA

T: +61 3 8532 2700

F: +61 3 9510 5955

W: [www.starpharma.com](http://www.starpharma.com)

 [@starpharma\\_ASX](https://twitter.com/starpharma_ASX)

## DEP®: THERAPEUTIC AND COMMERCIAL BENEFITS

Therapeutic Benefits	Flexible platform; broad applicability in targeted therapies	✓
	Unique ability to develop ADC's with significantly higher DAR than other approaches	✓
	Enhanced therapeutic window and ability to use cytotoxics and ultratoxics	✓
Commercial Benefits	Patent Protection	✓
	Innovative treatment options	✓
	Robust, scalable manufacturing	✓

## PATENTS

Starpharma holds a dominant position in the dendrimer IP landscape with a wide portfolio of patents and patent applications covering the composition and application of dendrimers in pharmaceutical, life-science and other fields.

Disclaimer: This brochure has been compiled to establish potential interest prior to a more detailed exchange of information. The document has been prepared in good faith but is provided without warranty or any other representation