ADVERTISING FEATURE

Innovation in drug development

Repurposing drugs offers pharma growth

A drug that relieved osteoarthritis would offer new hope for the millions affected by the condition around the world.

Paul Rennie, chief executive of fledgling ASX-listed pharmaceutical company Paradigm Biopharmaceuticals, believes the company's repurposed drug will make life enjoyable again and help delay joint replacement surgery until later in life.

It's also a clever example of drug repurposing, something that Rennie considers to be the future of drug development.

"Financial returns from a repurposed drug are the same as from a new one, but costs, risks, and time-to-market are all lower," he says.

Creating a new drug from scratch – de novo development – takes 15 to 18 years and costs $US2 billion, with a one-in-10 chance of success once the new drug has entered Phase 2 clinical trials. But taking a drug whose general safety has been proven and getting approval to market it for a new use takes three to five years and costs $US30 million to $US50 million, with the likelihood of success some five times higher than for de novo drugs.

Paradigm's "new" drug is pentosan polysulphate sodium, or PPS, which is derived from a sugar from the beechwood tree.

The company has exclusive worldwide rights to the injectable form of the drug for 20 years.

And although PPS is now off-patent, the manufacturing process is protected by a trade secret, providing extended protection for the intellectual property.

Paradigm has filed its own patents over the use of the drug to treat osteoarthritis and a number of other indications.

PPS has been used for decades as an oral anti-inflammatory to treat interstitial cystitis in the US and as an injectable anti-coagulant to treat conditions such as deep vein thrombosis in Europe.

This means Paradigm does not need to incur the tremendous costs of Phase 1 clinical trials, which establish the safety profile of new drugs in the general population.

AFL star Andrew Walker received the drug PPS via a special access program; (left) Paradigm Biopharmaceuticals' Paul Rennie.

The company only has to get through Phase 2 trials, to establish the efficacy in the target population, and Phase 3 trials, to establish efficacy in a larger target population across many different geographies.

Repurposing thus shortens the regulatory path to approval by the US Food and Drug Authority, which can accelerate approvals for Australia.

PPS is already used to treat osteoarthritis in dogs and horses, and now Paradigm is conducting a Phase 2 trial aimed at getting approval to use it for this purpose in humans. The rights also cover use for hay fever, viral arthritis and heart failure.

Rennie sees drug repurposing as an opportunity for Australia to participate in the global pharmaceutical industry.

"The industry as a whole is struggling to fund new drug development, and this will ultimately affect the cost of medications for consumers," he says.

"Smaller countries like Australia don't have huge reserves of capital like the US, Japan and some European countries, but we do have a depth of scientific talent and $US50 million is achievable in context of the Australian equities market.

"Less than a handful of companies in Australia are doing drug repurposing, while comparable economies like Sweden and Norway are doing much better."

Rennie says Paradigm's business model, in which it outsources the clinical trials to specialists, focuses on bringing this drug to market as efficiently as possible.

"So far, we've raised nearly $15 million in an IPO and a private placement.

"In future, we will partner with larger pharmaceutical companies who have manufacturing and distribution capacity."

Estimates of the number of people with osteoarthritis worldwide vary, but are generally around 10 per cent of the population.

"Osteoarthritis used to be considered a condition caused by mechanical wear and tear on the joint cartilage, but the current thinking is that it is a disease of the entire joint including the cartilage, bone and other tissues," Rennie says.

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> Paul Rennie

Clinicians estimate that about 60 per cent of patients have tissue changes known as bone marrow edema lesions (BMELs).

"At Paradigm, we think we can reduce, or even clear, those BMELs, and give people back their quality of life for many more years," Rennie says.

"The current symptomatic treatment plan for someone with OA is to give them progressively stronger pain relief, and eventually have them undergo surgery.

"Apart from the problems associated with the chronic use of traditional painkillers and anti-inflammatory drugs, surgery may not be for life and people have to face the possibility of a second round of surgery, or even a third, later in life."

A clinical study published in the peer-reviewed journal *BMC Musculoskeletal Disorders* in September 2017 recounted the case of 70-year-old Kaye O'Loughlin, who experienced "complete resolution of the bone marrow edema" and a significant reduction in knee pain after a course of PPS injections.

Still, there are hurdles ahead. Rennie says the results from the OA Phase 2 trial will not be known until late calendar year 2018 at the earliest. And then, assuming success, the drug must be taken through Phase 3 trials.

A personal testimonial has come from former Carlton AFL star Andrew Walker who was administered the drug via the special access program.