



The seeds of greatness

An innovative nutraceutical company

Abundant Produce is a Sydney-based life sciences company focused on the Abundant Natural Health brand, a range of scientifically validated, Over-The-Counter nutraceutical products utilising 100% natural biologics and minerals to provide relief from pain and inflammation. Abundant Produce's foundational business was Abundant Seeds, which uses cutting edge science to breed novel vegetable varieties for sale to the horticulture industry. This business is now considered non-core.

The market opportunities are significant

Abundant is currently gathering clinical data for two key indications, one in pain and one in psoriasis. Should the data be favourable there is substantial potential for OTC sales, as well as potentially moving to more prescription-type indications. Abundant Natural Health continues to develop its distribution channels, with; growing Australian pharmacy uptake; US warehousing to service Amazon.com sales; a US retail strategy in development; and a multichannel China cross-border strategy including mainland bonded warehousing; all easing the path to consumers.

There is potential to extract value from Abundant Seeds

There is potential to extract value from Abundant Seeds, with the business now selling cucumber seeds, and growers trialling tomato seeds, followed by eggplant, zucchini and capsicum in the product pipeline. In 2019 management has taken the strategic decision to investigate selling this business, taking advantage of international industry appetite for intellectual property related to vegetable plants.

Abundant is funded for the next stage of its growth

A recent SPP at 6 cents per share raised A\$1.3m, with all directors participating, and Executive Director and General Manager Tony Crimmins taking his holding to 19.9%.

Valuation range of A\$0.13–0.23 per share

We value Abundant at 13 cents per share base case and 23 cents per share optimistic case using a DCF-based valuation approach. We see Abundant potentially re-rating towards our valuation range as trials data emerges confirming the effectiveness of new Abundant Natural Health products, and as sales commence for those new products.

Share Price: A\$0.06

Valuation range: A\$0.13-0.23

ASX:ABT

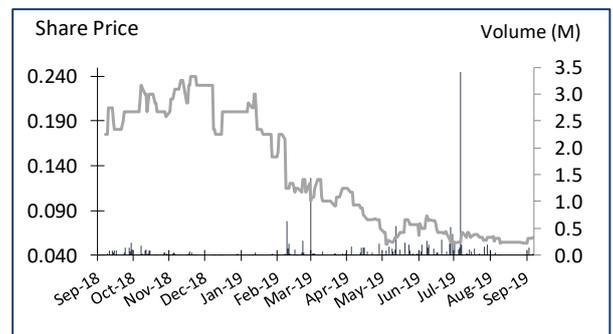
Sector: Food, Beverage & Tobacco

19 September 2019

Market Cap. (A\$ m)	4.9
# shares outstanding (m)	83.3
# share fully diluted	83.3
Market Cap Ful. Dil. (A\$ m)	4.9
Free Float	100%
12 months high/low (A\$)	0.24 / 0.052
1 / 3 / 12-month performance	7% / -14% / -67%
Website	abundantproduce.com

Source: Company, Pitt Street Research

Share price (A\$) and avg. daily volume (k, r.h.s.)



Source: Thomson, Pitt Street Research

Valuation metrics	
Fair valuation (A\$)	0.13-0.23
WACC	11.02%
Assumed terminal growth rate	3.0%-5.0%

Source: Pitt Street Research

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Please note Pitt Street Research and/or its directors hold stock in Abundant Produce as of the date of this report.

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*Abundant Natural Health
may have a new OTC
migraine treatment*

Introducing Abundant Produce, ASX:ABT

Abundant Produce is a Sydney-based life sciences company focused on the Abundant Natural Health brand, a range of scientifically validated, Over The Counter (OTC) nutraceutical products utilising 100% natural biologics and minerals to provide relief from pain and inflammation¹. Abundant Produce's foundational business was Abundant Seeds. This business, which uses cutting edge science to breed novel vegetable varieties for sale to the horticulture industry, is now considered non-core.

What kind of nutraceuticals does Abundant develop? Abundant Natural Health, which started up in 2017, sells OTC products mainly targeting the pain management and dermatologic therapy fields. The business evolved out of research relating to plant extracts identified in the company's seed business² in combination with mineral salts and magnesium obtained through a related company called EcoMag Ltd³. Abundant Natural Health is still at an early stage of development but offers significant potential for value creation because of the large scale of the unmet medical need that it seeks to address. We argue that a magnesium spray for treating migraines, and a gel that combines salt, magnesium and cucumber extracts to provide a psoriasis remedy, are both billion-dollar opportunities in the right hands.

Why is Abundant Produce's plant breeding business now non-core? Abundant Seeds breeds hybrid greenhouse vegetable strains with better yields, disease resistance, temperature tolerance and taste than existing commercial varieties, and sells the seeds of these plant strains to commercial food growers. While this operation addresses a large global market opportunity, it is currently a lower priority than Abundant Natural Health, where Abundant believes that return on investment is potentially much higher and faster to achieve. Such is the potential for Abundant Natural Health, that in 2019 management has taken the strategic decision to focus resources and capital on nutraceuticals, taking advantage of industry appetite for vegetable plant intellectual property to investigate selling the seeds business. Management plans to apply the funds received from the sale of the plant breeding business to ongoing development, manufacture and distribution of natural OTC nutraceuticals.

If Abundant Produce is so good, then why is it currently capitalised an only A\$4.9m (US\$3.4m)? We think the current share price of Abundant Produce reflects the slow sales build-up in the plant breeding business since the company's 2016 ASX listing and the fact that nutraceutical sales are currently at start-up levels. We see Abundant Produce re-rating as new products are launched by Abundant Natural Health and as sales continue to grow.

¹ See abundantnaturalhealth.com.

² See Abundant's 13 April 2017 market release headlined 'Tomato infusion product launch'.

³ See ecomagnesium.com.



Nine reasons to look at Abundant Produce

- 1. Science driven and entrepreneurial.** Abundant has pivoted the company's research and development resources from an initial plant breeding venture into a promising, evidence-based, nutraceuticals business. We rate very highly this ability to create new products and businesses as opportunities arise.
- 2. Abundant Natural Health has some promising products in the market and in development,** with a portfolio of biologic and mineral-based remedies applicable for multiple pain and dermatological conditions.
- 3. Abundant is gathering clinical data for two key indications,** one in pain and one in psoriasis. Should the data be favourable there is substantial potential for OTC sales, as well as, potentially, a move to more prescription-type indications.
- 4. Abundant's migraine opportunity is significant,** given that perhaps 2 million people in the US alone are treatment refractory migraineurs.
- 5. Abundant's psoriasis product could also find a large market,** with psoriasis having already created a multi-billion-dollar market in biologics-based treatments, and with patients looking for alternatives and particularly for natural remedies.
- 6. Abundant Natural Health** continues to develop its distribution channels, with; growing Australian pharmacy uptake; US warehousing to service Amazon.com sales, and a US retail strategy in development; and a multichannel China cross-border strategy including mainland bonded warehousing. All ease the path to consumers.
- 7. There is potential to extract value from Abundant Seeds.** This business's cucumber seeds are available now, and growers are trialling tomato seeds, with eggplant, zucchini and capsicum seeds in the product pipeline. In 2019 management has taken the strategic decision to investigate selling this business, taking advantage of international industry appetite for intellectual property related to vegetable plants.
- 8. Abundant is funded for the next stage of its growth and backed by the Board,** with a recent SPP at 6 cents per share raising A\$1.3m. All directors participated, and Executive Director and General Manager Tony Crimmins took his holding to 19.9%. We rate this as a very significant vote of confidence from the board and GM.
- 9. Abundant is undervalued based on our numbers.** We value Abundant at 13 cents per share base case and 23 cents per share optimistic case. We see Abundant potentially re-rating towards our valuation range as trials data emerges confirming the effectiveness of new Abundant Natural Health products, and as sales commence for those new products.

All Abundant directors participated in the recent SPP at 6 cents per share

Abundant Natural Health – Building for a large payday

Abundant Natural Health has been an important step forward for Abundant Produce. We think Abundant's entry into the nutraceutical space illustrates this company's capability for creating commercial opportunities. From 2012 Abundant's seed development work had been yielding various plant strains whose extracts had theoretical human health applications. In 2017 the company decided to put that theory into practice when it extracted unoxidized lycopene from its tomatoes to create 'Tomato Infusion', a daily



face cream⁴. Other nutraceutical products followed, and the team had, by 2019, created a business that was not only generating early and growing revenue for Abundant from multiple channels, but had the potential to address some large areas of unmet medical need.

Abundant Natural Health is building out its range. There are a small but rapidly growing number of nutraceutical products in Abundant's portfolio, either in development or currently being sold under the Abundant Natural Health label. These are:

Abundant Natural Health is exploring the therapeutic properties of magnesium

- **Musculoskeletal Pain Relief.** In its TGA- approved Magnesium Spray and Magnesium Gel, Abundant has combined magnesium with extracts from the new cucumber strains the seeds venture identified. The magnesium offers to relieve exercise related pain, improve muscular performance and recovery, and reduce cramps, while the cucumber extracts aid in improved bioavailability of the magnesium by exfoliating the skin for quicker dermal penetration, promoting direct absorption of magnesium in the area of discomfort. A Magnesium Lotion for the aging demographic is due for release before the end of calendar 2019.
- **Dermatological relief.** An 'Ocean Soothe' range is also slated for release in the December 2019 quarter, combining organic sodium chloride (sea salt) and magnesium with the cucumber extracts and other biologics to relieve the symptoms of psoriasis and other dry/irritated skin conditions. Abundant Natural Health has received endorsement from America's National Psoriasis Foundation (NPF), the world's largest psoriasis and psoriatic arthritis non-profit with an annual global reach of 2.5 million patients. This endorsement followed a Panel Review involving five US based dermatologists and five psoriasis sufferers. Initial inventories of Ocean Soothe Lotion and Gel are being manufactured in preparation for the coordinated launch of campaigns across Australia, the US and China. A complementary, magnesium-infused cleanser (Exfoliating Body Bar) is already on sale, capitalising on magnesium's natural antibacterial and antiviral properties.
- **Headache / migraine relief.** Abundant Natural Health has developed a 100% natural, opioid-free nasal spray for the treatment of headaches and migraines and is currently conducting public trials in conjunction with one of Australia's leading health and biomedical research leaders. Four additional products are under development and concepts are being developed for complementary products.
- **Anti-aging cosmetic skincare.** Abundant Natural Health has announced that it will shortly add a body lotion to its existing range of cosmetics containing lycopene extracts. Lycopene is an antioxidant found in the tomato plant. It is known to improve the firmness and texture of skin, thereby reducing fine lines and wrinkles⁵. Abundant Natural Health uses lycopenes from tomato varieties which its seeds business created.

Why magnesium and salt are important in the Abundant Natural Health story. The same team led by Tony Crimmins that has been building Abundant Produce since 2012 is also currently building a privately held magnesium producer called EcoMag Ltd. That company is commercialising a process for extracting very high purity magnesium from the 'bittern' waste stream of Australian solar salt producers. The EcoMag relationship has led the Abundant team to explore healthcare uses for magnesium and salt. This relationship was formalised in November 2018 when EcoMag took a A\$1m

⁴ See Abundant's 13 April 2017 market release headlined 'Tomato Infusion product launch'.

⁵ For some background on lycopenes in dermatology see Br J Dermatol. 2011 Jan;164(1):154-62. Epub 2010 Nov 29.



share placement in Abundant Produce at 20 cents per share. EcoMag currently holds 6% of Abundant Produce.

Abundant has the R&D smarts to create great products. We think the way in which Abundant created its Magnesium Spray and Magnesium Gel shows what this company is capable of in a produce development sense. The technology behind EcoMag for magnesium extraction had been created in South Korea by Professor Tam Tran, an authority on hydrometallurgy, when he was at Chonnam National University, and subsequently licensed to EcoMag. Speculating that their cucumber extracts could improve the bioavailability of magnesium, Tran, Crimmins and others collaborated with microbiologists at another Korean institution, Pusan National University, to develop a bacterial fermentation system that would remove sugars from the cucumber extracts but leave dermatologically active lactic acid⁶. We think this exercise shows that Abundant's products will not be 'copycat' in terms of the product qualities. The work on combining magnesium and cucumber extracts was published in the journal *Materials* in May 2019⁷.

Abundant Natural Health has the potential to grow rapidly. Sales of this business are currently at start-up levels, but can grow quickly, thanks to:

Abundant Natural Health is regularly launching new products

- **New products** – A look at slide 13 of Abundant's July 2019 corporate presentation will show several products slated for launch later in 2019 and into 2020, showing that Abundant has a highly productive R&D team.
- **New sales channels** – In addition to online sales, Abundant Natural Health products now range in 700 Australian pharmacies with distribution agreements in place potentially facilitating the growth of this figure to up to 5,000 over time. In the US, Abundant Natural Health has secured Amazon for warehousing and distribution of Abundant Natural Health's product range, facilitating sales within the U.S. and to 100 countries globally from the December 2019 quarter. Pain Relief was Amazon's largest and the fastest-growing category in the first half of calendar 2018⁸. In China, Abundant Natural Health is rolling out a strategy involving increased social media, a Chinese language website, China-specific packaging, mainland China based bonded warehouses and direct placement on cross-border ecommerce platforms, in preparation for a major distribution push at the China International Import Expo in Shanghai in November 2019⁹.
- **Endorsement from patient advocacy groups** – Witness, as a good example of this, the recent finding by the Review Panel of America's National Psoriasis Foundation¹⁰, which approved the use of its Seal of Recognition on Abundant's Ocean Soothe gel and lotion.

Potentially some 'blockbuster' indications – As we note below, an important trend in modern medicine is the reprofiling of old OTC-type remedies into important medical products. For Abundant two such opportunities lie in migraine and in psoriasis.

⁶ Lactic acid is important in managing the health of the various layers of skin – see, for example, *J Am Acad Dermatol.* 1996 Sep;35(3 Pt 1):388-91. The particular extracts which the team were working with were rich in citric acid, which provided plenty of sugars to convert.

⁷ *Materials* (Basel). 2019 May 25;12(10).

⁸ See *AMZ Effect: OTC Medication* by Peter Andrews, One Click Retail, 17 September 2018.

⁹ See ciie.org.

¹⁰ See psoriasis.org.



Abundant Natural Health's magnesium opportunity

Magnesium could be the basis of a large sales opportunity in natural health.

If Abundant management is correct, there is a large market opportunity awaiting its magnesium-based products, if it plays its cards right. Magnesium, Element No. 12 on the periodic table, is essential for a healthy body, regulating as it does muscle and nerve function, blood sugar levels, blood pressure and the making of protein, bone, and DNA¹¹. People can get enough magnesium in their bodies if they consume enough whole and unrefined grains, seeds, cocoa, nuts, almonds and green leafy vegetables¹² but this is increasingly a challenge with modern farming practices dropping the average content of magnesium and other minerals in a range of vegetables by 80–90% between 1914 and 2018¹³. If people become magnesium deficient, the consequences can be cardiovascular disease, Type 2 Diabetes, osteoporosis, pulmonary disease, depression, migraine, inflammation, and cancer¹⁴. We know that less than half of American adults have historically achieved the recommended daily intake¹⁵, however awareness of this issue appears to be rising¹⁶. That opens opportunities for businesses with new magnesium supplementation routes and new uses for magnesium in complementary medicine.

Abundant is currently going after several opportunities with its magnesium products¹⁷. One early opportunity may be in the sports performance area, where magnesium deficiency can impair exercise performance¹⁸ and where there is some evidence that magnesium supplementation may improve strength and cardiorespiratory function in healthy persons and athletes¹⁹. However, a more significant opportunity may be in pain relief, where there is an emerging body of evidence that magnesium works in neuropathic and inflammatory pain²⁰. Pain Management is estimated to be a US\$32bn market globally²¹.

Migraine could be a large market opportunity. Abundant is currently recruiting test subjects for a trial of a magnesium-based nasal spray in people suffering from frequent headaches and migraine²². People have been investigating the link between migraine with magnesium deficiency for a long time²³, and clinical work has pointed to intravenous magnesium as being effective in bringing down both the headaches as well as the accompanying nausea and vomiting²⁴. Should Abundant's researchers record similar outcomes – and their chances are good given that they have a novel delivery system in a fast-acting nasal spray²⁵ – the upside could be significant. Around 17% of US adults regularly get migraines²⁶ and probably around 5% of these, which would be 2 million people, are treatment refractory²⁷. The prevalence

**2 million American adults
get treatment-refractory
migraines**

¹¹ Curr Sports Med Rep. 2015 Jul-Aug;14(4):279-83.

¹² Rocznik Panstw Zakl Hig. 2013;64(3):165-71.

¹³ See Senbayram et. al. (2015), *Role of magnesium fertilisers in agriculture: plant–soil continuum*, Crop & Pasture Science, 2015, 66, 1219–1229

¹⁴ Physiol Rev. 2015 Jan;95(1):1-46.

¹⁵ J Nutr. 2011 Oct;141(10):1847-54. Epub 2011 Aug 24

¹⁶ 2019 *Ingredient Trends to Watch for Food, Drinks, and Dietary Supplements: Magnesium* by Jennifer Grebow, Nutritional Outlook, 5 February 2019.

¹⁷ Quote from abundantnaturalhealth.com: "Our innovative range of organic Magnesium products can be used before and after sport to prolong muscle performance as well as relieve the aches and pains of working out; improving performance, recovery and reducing the risk of injury. It provides relief from muscle aches, pain and cramps, DOMS, PMS, migraines; the list goes on!".

¹⁸ Magnes Res. 2006 Sep;19(3):180-9.

¹⁹ Can J Appl Physiol. 2001;26 Suppl:S13-22.

²⁰ Possibly by being an NMDA antagonist – see Curr Med Chem. 2016 Dec 12. [Epub ahead of print].

²¹ Source: *Chronic Pain Treatment Market to Reach USD 105.9 Billion by 2024*, P&S Intelligence: 7 January 2019.

²² See www.abundantnaturalhealth.com/nasal-spray-trial-1.

²³ See, for example, Clin Neurosci. 1998;5(1):24-7.

²⁴ Headache. 2001 Feb;41(2):171-7.

²⁵ Nasal delivery is fast acting because of the rapid absorption via the naso-mucosal layer – see Drug Deliv Transl Res. 2013 Feb; 3(1): 42–62.

²⁶ Source: 2011 National Health and Nutrition Examination Survey- see Headache. 2013 Mar;53(3):427-36. Epub 2013 Mar 7.

²⁷ BMC Neurol. 2011 Aug 1;11:94.



*One third of US adults
regularly use
complementary medicine*

of chronic migraine made the triptan drugs such as Imitrex and Zomig a multi-billion dollar one²⁸. The worldwide migraine market is estimated at US\$4bn²⁹.

The opportunity in psoriasis is also significant. That magnesium may be useful in treating psoriasis and other skin conditions has been shown in the growing body of work related to the therapeutic quality of Dead Sea salt³⁰. Abundant is currently recruiting test subjects with psoriasis for a trial of its Ocean Soothe range³¹ that combines salt, magnesium and cucumber extracts³². Around 3% of US adults have psoriasis³³, and this contributes to a multi-billion-dollar market for the biologics such as Remicade and Stelara that help treat it. Psoriasis treatment is estimated to be a US\$9bn global market³⁴.

Patients will buy Abundant's products while still using their prescription medications. The last three decades has seen the gradual mainstreaming of 'complementary medicine', where products available OTC are used alongside regular medications as patients search for treatment options and as researcher interest builds out the evidence on the complementary approaches³⁵. It is estimated that one third of US adults regularly use complementary medicine approaches in managing their health, with around one in five using nonvitamin, nonmineral dietary supplements³⁶. Out-of-pocket complementary medicine spending in the US totalled some US\$30bn in 2012, roughly 8% of all out-of-pocket healthcare spending³⁷. In the first half of calendar 2018 OTC medication sales on Amazon.com grew 65% following improvements in delivery times, making it realistic to buy last-minute necessities online³⁸.

The China factor. In November 2018, Abundant Natural Health attracted massive attention at the inaugural China International Import Expo (CIIE), recording long queues of attendees waiting to talk to staff but it was essentially an exploratory venture as they did not have the logistics in place to enter into distribution agreements. In November 2019 the Abundant team head to the CIIE again, this time ready to write business with cross-border logistics including mainland bonded warehousing in place. Given that, in the next five years, China is expecting to import over US\$10 trillion worth of products and services, and that an estimated 150,000 professional purchasers participate in the CIIE, it is hard to overstate the opportunity for Abundant Natural Health to enter the huge Chinese market.

²⁸ The FDA approval of Imitrex in 1992 represented a big step forward for migraine sufferers. Imitrex, generic name sumatriptan, was the first of the triptan class of drug. This class works by selective targeting 5-HT_{1B} and 5-HT_{1D} receptors in the Central Nervous System, avoiding other receptor subtypes that would mediate nausea and other side effects from earlier drugs such as the ergot alkaloids. Imitrex enjoyed peak sales of US\$1.4bn in 2007 for GSK and it prompted the development of other triptans, notably Maxalt from Merck & Co., Zomig from AstraZeneca, Axert from J&J and Frova from Endo.

²⁹ Source: *Global migraine market set to be worth USD 8.7 Billion by 2026*, Global Data, 22 September 2017.

³⁰ The Dead Sea, the deepest and most saline lake on earth, has been known from Biblical times for its healing properties. Salt from the Dead Sea in Israel is magnesium-rich – see dsmag.co.il. For a review of Dead Sea salt see *Semin Arthritis Rheum*. 2012 Oct;42(2):186-200. Epub 2012 Apr 12.

³¹ abundantnaturalhealth.com/psoriasis-trial-1.

³² There is less evidence that sodium chloride is useful in this product than magnesium. Having said that, there is some evidence for various health benefits of sea or rock salt, as evidenced, for example, by the use of halotherapy as a complementary medicine approach in the treatment of asthma and, possibly, COPD. In halotherapy patients sit in a salt-filled room and a 'halogenerator' pumps particles of pharmaceutical-grade sodium chloride into the room as a dry aerosol. For a study of halotherapy in asthma see *Pediatr Pulmonol*. 2017 May;52(5):580-587. Epub 2016 Oct 10. For work on COPD see *Int J Chron Obstruct Pulmon Dis*. 2014 Feb 21;9:239-46.

³³ *J Am Acad Dermatol*. 2014 Mar;70(3):512-6. Epub 2014 Jan 2.

³⁴ Source: *Psoriasis Treatment Market Worth USD 12.1 Billion by 2024: TNF Inhibitors to Emerge Most Valued Product, Predicts TMR*, HPS, 6 January 2017.

³⁵ Witness the fact that one of the 27 institutes and centers that make up America's National Institutes of Health is the National Center for Complementary and Integrative Health (NCCIH).

³⁶ Clarke et. al., *Natl Health Stat Report*. 2015 Feb 10;(79):1-16.

³⁷ For a summary of the data see the NCCIH press release dated 22 June 2016 and headlined 'Americans spent \$30.2 billion out-of-pocket on complementary health approaches'. There have been higher estimates – see, for example *Natl Health Stat Report*. 2009 Jul 30;(18):1-14.

³⁸ See *AMZ Effect: OTC Medication* by Peter Andrews, One Click Retail, 17 September 2018.



Abundant Natural Health's blue sky

Abundant Natural Health is expanding globally. With successful pharmacy penetration underway in Australia, a staged strategy for the rest of the AsiaPacific region being implemented, a US strategy commencing, and European plans on the drawing board, Abundant Natural Health has developed three cornerstone product categories with the capacity to launch the brand internationally in musculoskeletal pain, psoriasis pain and inflammation, and headache/migraine relief. Abundant is currently conducting public trials of a 100% natural, innovative and effective, opioid-free nasal spray for the treatment of headaches and migraines. Which begs the question as to the size of the opportunity.

Can nutraceuticals be the foundation of a billion-dollar company? A common belief among Life Science investors is that companies focused on products that could broadly be described as 'natural products' or 'dietary supplements' will find it difficult to transition into 'serious' pharmaceutical companies with patent-protected drugs that require regulatory approval before they can be marketed. That is because most natural products or dietary supplements are perceived as being unpatentable, so any clinical work that could extend their use into new indications would be unlikely to yield a commercial return. We believe that Abundant's share price currently labours under this stigma. However, we argue that the 'Supplements versus Rx Divide' is an artificial one, with evidence of numerous companies crossing over this divide to create serious amounts of shareholder value.

Many blockbuster drugs are derived from natural products

Many blockbuster drugs are derived from natural products. Potentially there are more than 100 drugs commonly used today that are still produced from botanical fractions and are not synthesised. Atropine, codeine, quinine and morphine are great examples of this³⁹. And one doesn't have to go too far back in time to find drugs that were first identified as natural products and then went on to commercial success. One estimate has suggested that around three in five of all chemotherapeutic agents developed between the early 1980s and the early 2000s were derived from natural or botanical products⁴⁰. The trouble with natural products is that Big Pharma tends to blow hot and cold on the field⁴¹, in spite of that fact that when a product like taxol comes along it can be a license to print money, and that there were many plant-derived cancer drug blockbusters before Taxol⁴². That drug, it will be recalled, became a commercial success in the 1990s even though its structure had been known since the mid-1960s⁴³. Abundant with a magnesium-based migraine therapy can fit easily into this tradition. We note, as well, the current large market capitalisations afforded to any company working on medicinal Cannabis or Cannabis-derivatives, which certainly fits the bill of a natural product group with blockbuster potential.

Patents are less of an issue for drug development these days. The first thing to note about the Supplements versus Rx Divide is that it ignores two important pieces of US legislation - the America's Orphan Drug Act of 1983 and the Waxman-Hatch of 1984⁴⁴. An Orphan Drug in the US is one that notionally serves less than 200,000 patients p.a. The Orphan Drug Act grants the developer of such a drug seven years of market exclusivity regardless of the intellectual property position around the product. Should Abundant

³⁹ Expert Opin Pharmacother. 2002 Feb;3(2):77-9.

⁴⁰ J Nat Prod. 2003 Jul;66(7):1022-37.

⁴¹ See J Nat Prod. 2004 Dec;67(12):2141-53.

⁴² J Ethnopharmacol. 2005 Aug 22;100(1-2):72-9.

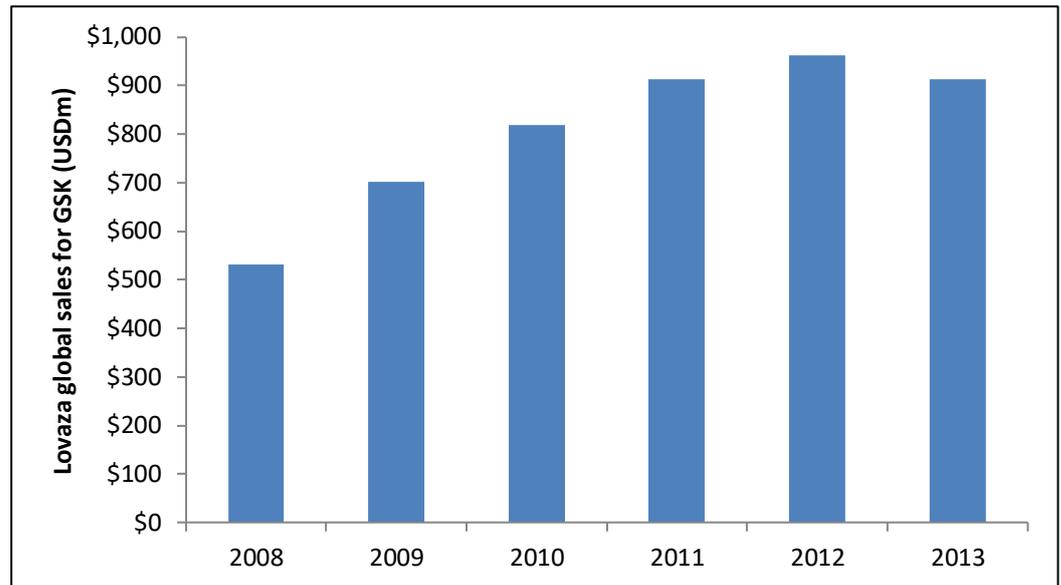
⁴³ Med Res Rev. 1998 Sep;18(5):315-31.

⁴⁴ The Waxman-Hatch Act's real name is the Drug Price Competition and Patent Term Restoration Act of 1984. Waxman-Hatch created the modern generic drug industry, among other achievements.



identify an Orphan indication for its products it can potentially explore this route with the FDA. Meanwhile under Waxman-Hatch a 'New Clinical Investigation' of an existing drug can gain three years of exclusivity regardless of market size or patent protection. So, the path across the Rx divide for any number of natural products or dietary supplements could simply be a matter of search the literature and running the studies suggested by it. A great example of a natural product blockbuster that started as an Orphan Drug was Allergan's Botox, which gained FDA approval in 1989 as a treatment for a rare eye disorder called blepharospasm⁴⁵.

Figure 1: Lovaza was a 'natural product' sales success for GSK



Source: Company

Omega-3 is a great example of a big-selling natural product remedy

Natural products, once reformulated and evaluated in randomised, controlled studies, can win big in a commercial sense. Just consider prescription Omega-3. The Omega-3 polyunsaturated fatty acids are found in oil from certain types of fish, vegetables, and other plant sources. These fatty acids are not made by the body and must be consumed in the diet. As is almost universally known in the Western world these days, consumption of the EPA and DHA forms of Omega-3⁴⁶ brings important cardiovascular benefits⁴⁷, in part through their lowering of the body's production of triglycerides⁴⁸. This knowledge has been building up since the 1950s⁴⁹ and is the reason why Omega-3 capsules are positioned in a prominent part of the health food section of your local grocery store. What has been particularly interesting has been the emergence since the 1990s of Omega-3-based drugs for cardiovascular disease, particularly for hypertriglyceridemia, that is, triglycerides that are way too high. This trend started with Omacor, a highly purified, prescription Omega-3 formulation with high concentrations of EPA

⁴⁵ Ther Adv Neurol Disord. 2015 Mar; 8(2): 82-91.

⁴⁶ Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) – it's recommended that whatever Omega-3 one takes, it have both EPA and DHA – see J Nutr. 2012 Mar; 142(3): 614S-625S. Omega-3 is known to be important in neurobiological health (Adv Neurobiol. 2016;12:247-74). The 60/40 ratio of EPA to DHA commonly found in many commercially available Omega-3 supplements is driven by research showing that this ratio seems to be effective against depression (J Clin Psychiatry. 2011 Dec;72(12):1577-84. Epub 2011 Sep 6.).

⁴⁷ Cardiovasc Res. 2007 Jan 15;73(2):310-5. Epub 2006 Sep 1.

⁴⁸ Curr Opin Lipidol. 2006 Aug;17(4):387-93.

⁴⁹ See Lancet. 1956 Apr 7;270(6919):381-3. The author of this letter, Hugh Sinclair (1910-1990), was an Oxford-based authority on nutrition.



and DHA which was developed in Norway by a company called Pronova in the 1980s and was launched on the European market in 1996⁵⁰. It is noteworthy that BASF acquired Pronova for US\$845M in 2013. A US company called Reliant Pharmaceuticals licensed the Omacor product from Pronova and gained FDA approval for it in 2004. By 2007, when the product's name was changed to Lovaza, it was such a commercial success that GlaxoSmithKline was prepared to buy Reliant for US\$1.65bn primarily for Lovaza. By 2012 Lovaza's sales had peaked at US\$960m and by 2014 the first generic was on the market⁵¹.

Valuing Abundant Produce

We valued Abundant on a DCF basis. We value Abundant at 13 cents per share base case and 23 cents per share optimistic case using a DCF approach. Our methodology was as follows:

- We conservatively assumed that a divestment of the Abundant Seeds business would yield A\$2-4m to the parent company based on its seeds inventory and portfolio of plant intellectual property⁵².
- We valued Abundant Natural Health on the assumption that its products would gain a following in areas normally dominated by Rx products, such as migraine, but where the drawbacks of existing therapies would also prompt usage of OTC products.
- We assumed a sales profile for Abundant Natural Health in which the business could grow to A\$2-4m p.a. in sales over the next five years, and then grow at 9-14% p.a. in the years that follow. In each case this is consistent with the growth experienced by other natural products companies⁵³.

Figure 2: Valuation criteria for Abundant Produce

	Base	Optimistic
Sales at year 5 (A\$m)	3.0	5.0
Growth rate year 6	15.0%	20.0%
Growth rate year 14	5.0%	10.0%
Initial gross margin	65.0%	75.0%
Initial expenses (% of sales)	25.0%	20.0%
Margin improvement factor	0.1%	0.2%
Capex (% of sales)	5.0%	10.0%
Ongoing tax rate	30.0%	30.0%
Amount set aside to working capital (% of revenues)	5.0%	3.0%
Terminal growth rate	3.0%	5.0%
Terminal margins	30.0%	30.0%

Source: Pitt Street Research

⁵⁰ Pronova was acquired by the German chemical company BASF in January 2013 for US\$845m.

⁵¹ It was Teva's product, FDA approved in April 2014.

⁵² We estimate that A\$7m has been invested in the business since 2012.

⁵³ For example, Blackmores has 600 product lines but annual sales of ~\$700m. Blackmores has grown sales from A\$148m in FY06 to \$717 in FY16, for a 17% p.a. growth rate.



General assumptions.

Discount rate. We used a WACC of ~12%, appropriate in our view for a 'High' risk rating. For a relevant discount rate, we use varying WACCs depending on the risk for Life Science companies. We start with a RFR of the Australian ten-year bond rate and an ungeared beta of 1.1 but use a variable MRP of 7.5%-11.5% (7.5% for 'medium risk' companies, 9.5% for 'high risk' companies and 11.5% for 'speculative' companies). We regard Life Science companies with existing businesses, or who have enough capital to reach the market with their products, as 'Medium' risk. Companies that have small revenue streams from marketed products but that are still potentially in need of capital are 'High' risk. Everything else is 'Speculative'.

Probability of success. We assume that Abundant's products can generate favourable data which would prompt a market following, and therefore assume limited clinical risk for the business;

Time horizon. We used a 14-year time horizon in our DCFs followed by a terminal value;

Currency. We assume the AUD/USD exchange converges on 0.7 over a three-year period from now.

Capital. Abundant Produce currently burns \$0.3m per month, so it is funded for at least around twelve months from mid-2019. We assume, for conservatism's sake, that one other capital raising will be required after the current one. Purely for valuation purposes, we assume a \$4m raising at 6 cents per share.

Figure 3: Our valuation of Abundant Produce

	Base	Optimistic
Value of Abundant Natural Health	7.3	21.0
Value of Abundant Seeds	2.0	4.0
Value of tax losses	2.2	2.2
Cash now	3.3	3.3
Cash to be raised	4.0	4.0
Total value	18.8	34.4
Total diluted shares (million)	150.0	150.0
Value per share	\$0.125	\$0.230

Source: Pitt Street Research

Re-rating Abundant Produce

We see several events helping to re-rate Abundant over the next twelve months

- New product launches by Abundant Natural Health;
- Public trial results in migraine and psoriasis;
- Increasing operational cash flows as each quarterly result is released;
- A potential sale of the seeds business.



Appendix I – Abundant’s foundation seed business, and why it is now non-core

Abundant Produce originated as vegetable seed development operation, where the company’s plant scientists would breed so-called ‘F1 hybrid’ greenhouse vegetables that had better yields, disease resistance, temperature tolerance and taste than existing commercial varieties. The company would then sell the seeds for these vegetables to vegetable producers globally. While Abundant Produce is currently prioritising the growth of Abundant Natural Health, it continues to build the capability of Abundant Seeds and we see potential for Abundant Seeds to emerge as an important player in the vegetable production business globally.

Abundant Seeds sells seeds for new kinds of vegetables. The origin of Abundant Seeds lies in a plant breeding operation that the University of Sydney’s Plant Breeding Institute conducts at Cobbitty, around 71 km southwest of Sydney. Over the years plant scientists working at Cobbitty had developed techniques to create greenhouse vegetables with properties different to those available in conventional vegetables, most notably the ability to grow such vegetables in ‘non-ideal’ conditions. Part of the competitive advantage of this breeding programme was the harsh Australian climate, allowing strains with high temperature tolerance to be identified. Tony Crimmins formed Abundant Produce in 2010 in order to commercialise the work of several of the scientists, led by Graham Brown and Nabil Ahmad⁵⁴. The company set up a dedicated breeding facility at Cobbitty and the scientists began work on new varieties of tomato (*Lycopersicon esculentum*⁵⁵) and cucumber (*Cucumis sativus*), with eggplant (*Solanum melongena*), capsicum (*Capsicum annuum*) and zucchini (*Cucurbita pepo*) intended to follow. Abundant Produce made its first seed sales in early 2015. In 2016 it went public on ASX after raising A\$3.5m at 20 cents per share, which valued the company post-money at A\$9.3m.

Abundant Seeds aimed to fill a niche which existing seed producers had missed. In 2016 vegetable seed production was estimated to be a ~US\$9bn global market⁵⁶. That market was dominated by three major chemical companies⁵⁷ – Monsanto⁵⁸, DuPont and Syngenta⁵⁹ – all of whom tended to emphasise seeds that would grow in state-of-the-art greenhouses. By contrast, Abundant Seeds wanted to create seeds that would flourish in ‘low-tech’ environments, since something like three-quarters of the world’s vegetables were sourced that way. Abundant’s initial target market was countries with established greenhouse infrastructure but where energy costs are high and extreme weather is prevalent. By 2018 Abundant had developed a large database of in excess of 5,000 plant lines that could provide a long tail of seed commercialisation opportunities over the next decade or so.

Abundant Seeds initially focused on cucumbers and tomatoes. For cucumbers the attraction was growing global demand combined with a short cropping cycle⁶⁰, making it relatively easy for producers to try new seed

Abundant Seeds creates new kinds of vegetable strains

Abundant has created about 5,000 new plant lines

⁵⁴ Ahmad, who gained his PhD at the University of Sydney in 2005, developed the first breeding program for F1 hybrid cucumbers in Australia with support from Abundant Produce.

⁵⁵ The tomato is also known by the scientific name *Solanum lycopersicum*. *L. esculentum* appears to be, strictly speaking, a naming error in terms of the accepted rules of plant taxonomy but because the tomato is such an economically important plant Terrell et al. in 1983 proposed the conservation of this name – see Taxon 32: 310-314. The conservation was ratified by the XIV International Botanical Congress in Berlin in 1987.

⁵⁶ See abundantproduce.com/abundant-seeds.

⁵⁷ A dedicated seed major is Groupe Limagrain, an agricultural co-operative group headquartered in Saint-Beauzire in central France -see limagrain.com.

⁵⁸ An American company sold to Germany’s Bayer in mid-2016 for US\$66bn in a deal first announced in September 2016 that took close to two years to close because of the need to gain US and EU regulatory approval.

⁵⁹ A Swiss company acquired in 2016 by ChemChina, a Chinese state-owned enterprise, for US\$43bn.

⁶⁰ For example, in California cucumbers only take 55-70 days to go from seed to first fruit harvest (source: Schrader, Aguiar and Mayberry, *Cucumber Production in California*, ANR Publication 8050, Agriculture and Natural Resources Communication Services, University of California)>



varieties. For tomatoes the attraction was that more of this vegetable is consumed globally than any other⁶¹, with consumers very interested in varieties with better taste properties.

- Abundant's first cucumbers, varieties of Lebanese cucumber, were launched in October 2016⁶². These cucumbers retained the shiny and slightly ribbed texture that producers were looking for but had much higher yield. Abundant set up production facilities for its seeds in Australia and Chile for sale into global markets but with an initial focus on Australia where there was virtually no domestic seed production. In 2019 Abundant began commercial release of other varieties such as longer and 'mini' cucumbers as well as an unusually sweet-tasting variety⁶³.
- Abundant initially developed tomatoes with better flavour⁶⁴, colour and heat tolerance⁶⁵, with a particularly promising cherry tomato among five varieties that were available for commercialisation by July 2017. The company has also talked about its mini heirloom tomatoes⁶⁶ as well as baby romas and mini plums⁶⁷. First commercial tomato seed sales are expected soon.

Abundant Seeds' sales are still at a start-up stage. By September 2018 Abundant was able to announce that sales of cucumber seeds were rising but the company has yet to earn much revenue from seed sales. Sales continue to build in Australia through word of mouth from growers with multiple successful seasons and targeted promotions. And trials of seeds are underway in the US, Canada, Mexico, the Middle East and Vietnam. However, such trials are a staged, multi-year process and therefore may take a while to deliver commercial results.

Why Abundant Produce is moving out of the seeds business. M&A activity in the plant breeding industry is building apace. Major international players are moving into the vegetable seeds sector by acquiring companies with commercial intellectual property. Abundant Produce noted this trend in its July 2019 corporate presentation, on slide 10, which highlighted the recent acquisition by the German seed company KWS⁶⁸ of the Dutch-based Pop Vriend Seeds⁶⁹, allowing KWS to enter the vegetable seed business. Such is the potential for Abundant Natural Health's new products, that management has taken the decision to focus resources and capital on that business and see what buyers there are for Abundant Seeds.

Appendix II – An Abundant Produce glossary

Antioxidants – Substances that neutralise oxygen in free radicals, which can damage cells in the body. Lycopene has antioxidant properties.

Baby Roma – See Roma tomato.

Bioavailability – The quantity of a drug or nutraceutical that is able to make it to its target once inside the body. High bioavailability is an important component in a drug's prospects for commercial success.

⁶¹ 182 million tonnes in 2017 (source: FAO).

⁶² The cucumbers were called Ultimo (for the warmer months) and Jyndy (for the cooler months).

⁶³ See Abundant's 8 July 2019 corporate presentation, slide 7.

⁶⁴ As measured by the 'Brix number'.

⁶⁵ See the Abundant market release dated 31 May 2016 and headlined 'Hybrid tomato programme nears completion of internal trials'.

⁶⁶ See Abundant's 7 September 2018 corporate presentation, slide 11.

⁶⁷ See Abundant's market release dated 31 May 2019 and headlined 'Business update'.

⁶⁸ Einbeck, Germany, FWB: KWS, kws.com.

⁶⁹ Andijk, The Netherlands, popvriendseeds.com.



Brix – A measure of the sugar content of an aqueous solution.

Cherry tomatoes – Small tomatoes noted for their sweetness.

Cultivar – A plant strain with certain desirable characteristics. For example, Roma and Plum are cultivars of tomato.

Daigou – A style of retailing popular in China in which individual shoppers personally source products outside of China and sell them within China via social media platforms.

Dermatitis – Skin inflammation that features eczema. Dermatitis comes in various forms including atopic dermatitis (dermatitis related to allergies) or seborrheic dermatitis (dermatitis in the oil-producing glands such as in the scalp)

Eczema – A skin rash characterised by dry, scaly, red and itchy skin.

F1 hybrid – Plants that have been selectively bred by cross-pollinating two different parent plants. F1 stands for 'Filial 1', indicating the 'first children' of the crossing. This kind of plant breeding is the kind that the Augustinian monk Gregor Mendel (1822-1884) practised in the 19th Century.

Free radicals – Molecules with unpaired electrons that therefore must combine with complementary molecules before they become stable. If a free radical forms a bond with a positively charged molecule, its charge is neutralised. Oxygen in the free radical form can damage cells in the body in a process called oxidative stress.

Heirloom plants – Cultivars that have historically been produced but are generally not widely produced in the present due to qualities in the fruit that are unsuitable for mass production, such as lower disease resistance. They tend to have qualities that consumers still desire, generally to do with taste.

Lactic acid – An organic acid produced in the muscle tissues during strenuous exercise.

Lebanese cucumber – A cucumber cultivar which is more or less seedless and is noted for its small size, smooth skin and mild taste.

Lycopene – The carotenoid pigment that gives ripe tomatoes their characteristic deep-red colour. Lycopene has antioxidant properties.

Migraine – An intense headache that mostly occurs on one side of the head, but it can also be on both the sides.

Nutraceutical – A nutritional product that also has pharmaceutical properties. Nutraceuticals need not be based on foods and need not be delivered orally, but the nutraceuticals field also encompasses 'functional foods', that is, foods that provide health benefits beyond energy and essential nutrients.

OTC – Short for 'Over-the-Counter', medical products available without a prescription.

Oxidative stress – Cell damage that results from oxygen-linked free radicals.

Plum tomato – A tomato cultivar used primarily for sauce and packing purposes.

Psoriasis – A chronic skin disease, which sees the sufferer developing unsightly patches of raised red skin covered by a flaky white buildup. Psoriasis is an autoimmune disorder.

Roma – A tomato cultivar noted for its elongated shape and sweet flavour.

Supercritical fluid – A fluid that has been heated above a 'critical' point where it takes on the properties of both a gas and a liquid.

TGA – The Therapeutic Goods Administration, Australia's answer to the FDA.



Appendix III – Abundant Produce’s Intellectual Property

Abundant Seeds. While plants may be patented in most jurisdictions⁷⁰, Abundant has relied on trade secrets for its database of plant strains.

Abundant Natural Health. Most formulations of nutraceuticals are difficult to patent, so Abundant has relied on trade secrets for its nutraceutical and cosmetic products.

Appendix IV – Abundant Produce’s Capital structure

Class	% of fully diluted	
Ordinary shares, ASX Code ABT (million)	83.3	100.0%
Options (million)	0.0	0.0%
Fully diluted shares	83.3	
Current market cap:	A\$5 million (US\$3.4 million)	
Current share price	\$0.060	
Twelve month range	\$0.052 - \$0.24	
Average turnover per day (last three months)	64,200	

Appendix V – Major shareholders

- Tony Crimmins (20%)
- Adam Hajek, an Abundant Produce founder and former Chief Operating Officer (6.4%)
- EcoMag (6.0%)

Appendix VI – Analyst qualifications

Stuart Roberts, lead analyst on this report, has been covering the Life Sciences sector as an analyst since 2002.

- Stuart obtained a Master of Applied Finance and Investment from the Securities Institute of Australia in 2002. Previously, from the Securities Institute of Australia, he obtained a Certificate of Financial Markets (1994) and a Graduate Diploma in Finance and Investment (1999).
- Stuart joined Southern Cross Equities as an equities analyst in April 2001. From February 2002 to July 2013, his research specialty at Southern Cross

⁷⁰ See, for example, 35 U.S. Code § 161 - Patents for plants.



Equities and its acquirer, Bell Potter Securities, was Healthcare and Biotechnology. During this time, he covered a variety of established healthcare companies such as CSL, Cochlear and Resmed, as well as numerous emerging companies. Stuart was a Healthcare and Biotechnology analyst at Baillieu Holst from October 2013 to January 2015.

- After 15 months in 2015 and 2016 doing Investor Relations for two ASX-listed cancer drug developers, Stuart founded NDF Research in May 2016 to provide issuer-sponsored equity research on ASX-listed Life Science companies
- In July 2016, with Marc Kennis, Stuart co-founded Pitt Street Research Pty Ltd, which provides issuer-sponsored research on ASX-listed companies across the entire market, including Life Science companies.

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