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# Bioshares

8 April 2019  
Edition 787

*Delivering independent investment research to investors on Australian  
biotech, pharma and healthcare companies*

Companies covered: **EMV, VHT, Quarterly Review**

## Quarterly Review

### Stocks Surge, Funding Plummet

For the March quarter 2019, the **Bioshares Index** recorded its strongest quarterly gain since the third quarter of 2013. The Bioshares Index increased by 16.2% from the previous quarter, nearly offsetting the steep loss in the previous quarter of -19.5%.

The uplift in the Bioshares Index was due to strong gains made by Avita Medical (+252%), Paradigm Biopharmaceuticals (+80%), Nanosonics (+54%), Clover Corp (+51%) and Clinuvel Pharmaceuticals (+35%). The Bioshares Index is made up of 119 small cap life science companies.

The **Bioshares Large Cap Index** posted a lacklustre performance. The subdued performance of this sector was due to a 24% decline in Blackmore's share price (whose CEO resigned during the quarter), a 10% decline in Mayne Pharma's share price and a 9% decrease in Resmed's share price. There was no change in Cochlear's share price from the end of the December quarter 2018, and CSL shares increased by 5%.

The **Bioshares Botanicals Index** rose by 17.3% for quarter, with the increase solely due to an 82% gain made by Elixinol Global (Cap'n; \$565 million). The company listed in Q3 2018, after raising \$40 million. The company sells hemp dietary supplements and skin care products and has moved into the medical cannabis market. Revenues for the year ending December 31, 2018, were \$37 million, an increase of 121%. The Bioshares Botanicals Index comprises of 18 companies.

The Nasdaq Biotech Index, the leading index for gauging global sentiment towards biotech stocks, registered a 13% increase for the March quarter, which like the Bioshares Index, retraced ground lost in the deep market downturn that took place in the last quarter of 2018. A notable event during the quarter was the resignation of FDA Commissioner Dr Scott Gottlieb. Since his appointment in May 2017, he developed a reputation as a receptive and attentive administrator and driver of change and modernisation.

### Capital Raisings

In contrast to a number of remarkable stock price gains over the quarter, capital inflows slumped dramatically in the March quarter, with \$37 million raised through placements, SPPs and rights issues. In the previous quarter, \$173 million was raised, with an average of \$200 million being raised each quarter for the last eight quarters. The slump could be viewed as a lagged effect of the previous quarter's weakness.

	Bioshares Portfolio
Year 1 (May '01 - May '02)	21.2%
Year 2 (May '02 - May '03)	-9.4%
Year 3 (May '03 - May '04)	70.6%
Year 4 (May '04 - May '05)	-16.3%
Year 5 (May '05 - May '06)	77.8%
Year 6 (May '06 - May '07)	17.4%
Year 7 (May '07 - May '08)	-36%
Year 8 (May '08 - May '09)	-7.4%
Year 9 (May '09 - May '10)	50.2%
Year 10 (May '10 - May '11)	45.4%
Year 11 (May '11 - May '12)	-18.0%
Year 12 (May '12 - May '13)	3.1%
Year 13 (May '13 - May '14)	26.6%
Year 14 (May '14 - May '15)	23.0%
Year 15 (May '15 - May '16)	33.0%
Year 16 (May '16 - May '17)	16.8%
Year 17 (May '17 - May '18)	-7.1%
Year 18 (May '18 - current)	-6.6%
<b>Cumulative Gain</b>	<b>647%</b>
<b>Av. Annual gain (17 yrs)</b>	<b>17.1%</b>

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## 15<sup>th</sup> Bioshares Biotech Summit

26–27 July 2019

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[www.bioshares.com.au/queenstown2019.htm](http://www.bioshares.com.au/queenstown2019.htm)

## Bioshares Index – Top 10 Outperformers - Mar Quarter

Company	Code	Cap. \$m	Change - Quarter	Change - Year	Price 31/3/19
Avita Medical	AVH	531	252%	400%	\$0.285
Jayex Healthcare	JHL	6	84%	119%	\$0.035
Paradigm Biopharm.	PAR	264	80%	550%	\$1.885
Heramed	HMD	23	66%	0%	\$0.265
Botanix Pharmaceuticals	BOT	88	64%	5%	\$0.115
Bluechiip	BCT	46	63%	44%	\$0.088
Nanosonics	NAN	1308	54%	70%	\$4.360
Resonance Health	RHT	37	53%	338%	\$0.092
Clovercorp	CLV	342	51%	118%	\$2.070
Factor Therapeutics	FTT	3	50%	-93%	\$0.003

## Outperformers

Avita Medical was the Bioshares Index's breakaway performer for the March quarter, with a 252% quarterly increase. The stock did not immediately gain momentum once clearance of ReCell by the FDA was gained in September. However, a key \$40 million capital raising in December, and the release of pre-launch sales data for the December quarter probably helped investors check boxes about potential sales uplift and a secure funding base, before buying the stock.

Jayex Healthcare (+84%) announced a revised strategy to commercialise its P2U and BluePoint offerings in New Zealand's medicinal cannabis market.

Paradigm Biopharmaceuticals elevated its market cap to \$264 million. Its 80% share price gain was driven by the positive Phase IIb trial results of injectable pentosan polysulphate sodium in patients with knee osteoarthritis.

Paradigm said that it "believes there is a high probability that the drug will be successful in a Phase 3 clinical trial and therefore will have big pharma licensing/partnering interest."

Heramed's shares increased by 66%, possibly inspired by an order from a Brazilian group for its ultrasound foetal heart monitor. (*Today the company responded to questions from the ASX regarding its financial performance and position.*)

Early in the quarter, investors began buying Botanix Pharmaceuticals stock (+64%), ahead of the release of results from its Phase 1b trial of BTX 1308 in psoriasis in Q2 2019, and the commencement of a Phase II atopic dermatitis study of BTX 1204.

## Bioshares Index – Bottom 10 Underperformers - Mar Quarter

Company	Code	Cap. \$m	Change - Quarter	Change - Year	Price 31/3/19
Oncosil Medical	OSL	34	-71%	-58%	\$0.054
Neurotech International	NTI	2	-64%	-91%	\$0.016
Cogstate	CGS	27	-62%	-71%	\$0.230
Visioneering Tech.	VTI	17	-55%	-84%	\$0.069
Allegra Orthopaedics	AMT	12	-40%	0%	\$0.120
Phosphagenics	POH	5	-40%	-77%	\$0.003
Regeneus	RGS	23	-39%	-8%	\$0.110
Bioxyne	BXN	13	-36%	-74%	\$0.021
Biotron	BIT	45	-35%	200%	\$0.075
Dorsavi	DVL	8	-34%	-80%	\$0.041

## Underperformers

An unfavourable assessment of Oncosil Medical's CE Mark filing by a clinical oversight committee of the British Standards Institute contributed to a 71% decrease in the company's share price over the quarter.

Neurotech International's move to a new revenue model did not engender investor confidence, as did the revelation that the company's scientific founder and former employee did not after all hold a PhD from University College London, but did hold one from the University of Milan.

Cogstate's shares (-55%) have been impacted by Alzheimer's disease Phase III trial failures and discontinuations, which has depressed the demand for its clinical trial services. (See *Bioshares* 782 and more recently *Bioshares* 785)

Visioneering Technologies (-55%) scored a Survival Index measure of 0.5 when we tabled our analysis of cash positions in *Bioshares* 778. A 0.5 measure means that a company has approximately six months of cash at hand to fund operations, based on previous spending and income patterns. Since then the company has not made any obvious progress on addressing its cash position.

Allegra Orthopaedics's shares fell by 40%, due in part to a softening in sales in the half year ended December 31, 2018, which were down 15% from the same period a year ago.

Phosphagenics shares, down 40%, continued to suffer from the failed arbitration it had pursued with Mylan. The company held cash of \$2.1 million at the end of the year ending December 31, 2018.

## Bioshares

## Index Performance by Quarter (Change from previous Qtr)

	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019
Bioshares Index	2.8%	0.4%	8.3%	-19.5%	16.2%
Bioshares Large Cap Index	8.9%	20.5%	5.6%	-7.5%	1.4%
Bioshares Botanicals Index	9.6%	-1.9%	-5.2%	-20.3%	17.3%
<b>Nasdaq Biotech Index</b>	<b>-0.1%</b>	<b>2.8%</b>	<b>11.2%</b>	<b>-20.6%</b>	<b>13.0%</b>
ASX 300 Index	-4.9%	7.5%	-0.2%	-8.8%	9.5%

## Selected Clinical Trial Developments - Q1 2019

Company	Code	Product/Therapeutic	Event
Actinogen Medical	ACW	Xanamem (Alzheimer's disease)	DSMB confirmed 186 patient, Phase II trial to continue w without change. Results expected Q2 2019.
Antisense Therapeutics	ANP	ATL1102 (Duchenne Muscular Dystrophy)	Reported enrollment of 5th pt in 9 pt trial. (Pts are non-ambulant)
Bionomics	BNO	BNC210 (PTSD)	Reported further analysis of Phase II trial, 193 pts, w hich show ed the potential for significant pt benefit w hen drug exposure is adequate
Dimerix	DXB	DMX200 (focal segmental glomerulosclerosis)	Reported 70% enrollment in a 10pt Phase II study. Dosing completion expected Q4 2019.
Dimerix	DXB	DMX200 (diabetic kidney disease)	Reported 25% enrollment in a 40pt Phase IIb study. Dosing completion expected Q4 2019.
Ellex Medical Lasers	ELX	Selective laser trabeculoplasty (SLT)	Study in 718 subjects show ed that SLT w as safe and effective as a first line treatment for open angle glaucoma and ocular hypertension, w ith condition able to be controlled for 3 years w ith out eye drops
Emvision	EMV	Microw ave emitting brain scanner (Clinical prototype)	Reported positive safety observations from study in 10 healthy human volunteers
Immuron	IMC	IMM-529 (c. difficile)	Phase I/II trial has not met recruitment targets in Israel. Company has made changes to recruitment protocol. Will open sites in Australia. Will focus on recurrent c. difficile infections.
Immutep	IMM	IMP321 (soluble LAG3 Ig fusion protein) (head and neck cancer)	Dosed first pt in 109 pt Phase II trial, across sites in US, EU and Australia. In combination w ith pembrolizumab.
Mesoblast	MSB	Revescor (allogeneic mesenchymal precursor stem cells - MPCs) (advanced chronic heart failure)	Dosed final pt in 566 pt Phase III trial. Primary endpoint is reduction in heart-failure related hospital admissions, secondary endpoint is reduction in cardiac deaths
Pharmaxis (w ith Boehringer Ingelheim)	PXS	BI1467335 (amine oxidase inhibitor) (NASH)	Enrollment completed in 114 pt Phase IIa trial. Trial is expected to report in H2 2019.
Pharmaxis	PXS	Pan LOX inhibitor (pancreatic cancer)	Commenced dosing in Phase I trial. First stage SAD in 40 healthy subjects; second stage MAD in 16 healthy subjects
ResApp Health	RAP	ResAppDx (smartphone app for the diagnosis childhood acute respiratory disease using cough sounds)	Reported top-line results for croup and updated top line results for primary upper respiratory tract disease. Reported PPA of 74% and NPA of 74% for croup. The small numbers of croup diagnoses of 2% (29 w ith croup, 1207 w ith out croup) means the company w ill not pursue a US regulatory filing for croup.
Rhythm Biosciences	RHY	ColoSTAT (early detection of colorectal cancer) (blood test)	Enrolled first pt in 1,000 pt trial. A cross sectional, multi-site study for detection relative to colonoscopy and Faecal Immunohemical Test (FIT).

## Capital Raisings by Australian-listed Biotech Companies Q1 2019

Company	Code	Investment Manager or Investor	Type of Raising	Funds Raised (\$M)
Avita Medical	AVH	Cow en & Co / Bell Potter	Placement (T2)	\$15.2
Avita Medical	AVH		SPP	\$1.8
Prescient Therapeutics	PTX	Bell Potter / Aurenda Securities	Placement	\$7.0
Total Brain	TTB	Blue Ocean Equities	Placement (T1)	\$3.7
Recce	RCE	DJ Carmichael	Placement	\$1.8
Antisense Therapeutics	ANP		Placement	\$1.6
Prana Biotech	PBT		Placements	\$1.5
Pharmaust	PAA	Alto Capital	Rights Issue	\$1.3
Respiri	RSH		SPP	\$1.0
Medibio	MEB		Rights Issue	\$0.92
Neurotech	NTI		Rights Issue	\$0.78
Factor Therapeutics	FTT		Placement	\$0.42
Genera Biosystems	GBI		Rights Issue	\$0.24
<b>Total raised in Q1 2019</b>				<b>\$37.2</b>
<b>Total raised YTD 2019</b>				<b>\$37.2</b>

**Bioshares Model Portfolio (8 April 2019)**

Company	Code	Price (current)	Price added to portfolio	Recommendation	Cap'n (\$M)	Date added
Clinuvel Pharmaceuticals	CUV	\$25.80	\$4.15	Hold	\$1,237	December 2014
Volpara Health Technologies	VHT	\$1.750	\$0.375	Spec Buy A	\$314	June 2017
Opthea	OPT	\$0.700	\$0.160	Spec Buy A	\$175	November 2014
Somnomed	SOM	\$1.750	\$0.94	Spec Buy A	\$110	January 2011
Immutep	IMM	\$0.030	\$0.032	Spec Buy A	\$102	March 2019
Pharmaxis	PXS	\$0.255	\$0.260	Spec Buy A	\$101	December 2016
Bluechiip	BCT	\$0.090	\$0.053	Spec Buy B	\$47	December 2018
Micro-X	MX1	\$0.265	\$0.38	Spec Buy A	\$40	May 2017
Acrux	ACR	\$0.240	\$0.31	Spec Buy A	\$40	July 2017
Adalta	1AD	\$0.240	\$0.23	Spec Buy A	\$28	July 2017
Dimerix	DXB	\$0.085	\$0.09	Spec Buy B	\$13	December 2018

**Portfolio Changes – 8 April 2019**

**IN:**  
No changes

**OUT:**  
No changes

We have changed the recommendation for VHT from **Spec Buy A** to a **Spec Hold A**

**Stocks Removed from Bioshares Portfolio in TTM**

Date removed	Stock
March 2019	CYP
March 2019	CGS, MGZ
February 2019	RNO
November 2018	FTT
October 2018	BNO
September 2018	DVL, MEB, OSP

**Volpara Health Technologies – 71 Contracts Added in the Last 12 Months**

Volpara Health Technologies (VHT: \$1.75) signed at least 71 contracts in FY2019 (ending 31 March) with its breast density assessment technology now used to assess 7% of all women screened for breast cancer in the US.

For its Q4, the company reached a number of milestones, reflecting the continued strong growth and demand for its technology and service.

Its annual recurring revenue (or repeat revenue) increased by more than NZ\$1 million for the first time in a quarter in Q4, to NZ\$6.6 million.

The total contract value (with contracts signed representing up to five years of revenue) reached NZ\$5 million for the first time in a quarter in Q4. This includes the first NZ\$1 million contract signed.

The number of customers increased by 71 to 128 at the end of March over its financial year.

Other major events over the quarter include the first sale of its *VolparaLive* product.

Volpara continues to innovate to maintain a competitive lead, having recently added the new *Live* product to provide real time feedback on the quality of mammogram readings to prevent patient recalls.

Its sales in the last quarter included to prestigious hospitals in the US such as MD Anderson and UCSF (University of California, San Francisco).

**US Legislation**

As noted in *Bioshares* 784, a law was passed in February this year mandating that all women in the US be informed of their breast density level; women with higher breast density measures are more susceptible to breast cancer and it is more difficult to accurately screen for breast cancer with a mammogram when there is a high breast density.

This new mandate should help Volpara reach in excess of 30% of the US market in the next few years, which would equate to around NZ\$28 million in recurring annual revenue from the US alone.

Volpara Health Technologies is capitalised at \$314 million.

*Bioshares* recommendation: **Speculative Hold Class A**

**Bioshares**

## **Emvision Medical Devices to Start Stroke Diagnosis Trial in H2**

Emvision Medical Devices (EMV: \$0.38) listed on the ASX last year at \$0.25 a share, raising \$6 million. The company is commercialising a novel imaging technology that uses non-ionising microwaves to create 3-D images, with the first application being for use in stroke diagnosis with an instrument called the Brain Scanner.

In January this year the company completed a Phase I safety study in 10 healthy volunteers. Subjects were scanned with low power microwaves and it was found, using a thermal camera, that no tissue warming occurred from the 6 second scan, with the image acquired in just 3 seconds. It takes around 30 seconds to process the images taken.

The level of radiofrequency energy absorption was found to be well within safety limits, at a fraction of the radiation generated by a mobile phone according to the company. There was no discomfort experienced by the volunteers, with the tissue temperature slightly falling during the process due the liquid within the headset worn.

Having passed the first phase of clinical testing, the next stage is to move onto patients who have experienced a recent stroke. Ethics approval was gained last week to proceed with a pilot study in patients at the Princess Alexandra Hospital in Brisbane. The trial is expected to start in H2 2019, with 30 patients to be recruited, roughly half whom have experienced a haemorrhagic stroke (brain bleed) and half an ischemic stroke (brain blood clot).

### **Immediate Diagnosis and Treatment in 'Golden Hour' Crucial**

Around 85% of strokes occur due to a blood clot, with the treatment requiring injection of tissue plasminogen activator (tPa). Treatment for brain bleeds is distinctly different and can include reducing blood pressure, cessation of any anticoagulant therapy, and treatment with blood clotting factors.

Given the opposing treatments, it is crucial to determine rapidly the nature of the stroke before applying treatment. It is recognised that the most effective therapeutic outcome can be achieved if treatment is started within the first hour. For that to occur, diagnosis using CT scans and MRI is required. However these modalities are generally only available in the hospital setting.

In the last few years, mobile stroke ambulances have been set up containing a CT scanner. However, due to the size of this instrument, significantly larger vehicles have been required with a much higher cost. In 2017, the first Mobile Stroke Unit was launched, based at the Royal Melbourne Hospital. The purpose built ambulance weighs 5.3 tonnes. The Melbourne mobile stroke unit is a \$8 million five year pilot program with the concept in its infancy.

Melbourne's mobile stroke unit is staffed by a neurologist, radiographer, stroke nurse and paramedic, with the capacity to immediately start treatment with tPa following a positive ischemic stroke diagnosis. Presumably as the technology and processes evolve, which hinges on lower cost stroke imaging modalities becoming

available, many more ambulances can be fitted with brain imaging instruments.

### **Results from Pilot Study in Ohio**

As reported previously in *Bioshares* 781, a pilot study was conducted in Ohio with their mobile stroke unit based at Mercy Health in Toledo. That study found that 30% of ischemic stroke patients treated through the mobile stroke unit received tPa therapy in the first hour following the injury, compared to only 4.8% of patients receiving traditional care through the emergency department.

### **Initial Application for Emvision Technology**

The initial application of the Emvision instrument will for the continuous or regular monitoring of patients who have had a stroke and following treatment. The use of safe, non-ionising microwaves to monitor the brain is a distinct advantage over CT scans for repeated or ongoing imaging, with CT scans involving high energy X-ray radiation.

Subsequent applications are for use in the ambulance setting to assist in providing immediate stroke diagnosis and in smaller, rural hospitals or clinics that are not equipped with a CT scanner.

### **Advantages of Microwave Scanning**

The first obvious advantage of the Emvision imaging approach using microwaves is the reduced size of the instrument (less than 10kg) the fraction of the cost of a CT imaging machine.

The second and less obvious advantage is the benign safety profile of using low energy, non-iodizing microwaves. This provides the option of repeated diagnostic use on the same patient to assess blood flow in the brain following treatment, which will become the initial commercial application for the technology. Of those patients who have an ischemic stroke, 6% will go on to have a subsequent bleed in the brain

### **Technical challenges**

One of the core risks with Emvision is the technical risk. The next challenge for the company is to refine its algorithm to ensure accurate location of blockages or bleeds in the brain can be achieved with the technology.

Although the company has proven the safety of the system, to date imaging data has only been obtained from simulated models in the laboratory, being able to differentiate between different tissue types (with no blood flow). Animal models have not been suitable to build and define the algorithm. There are currently around 15 researchers at the University of Queensland (UQ) working on this project.

Prior to commencing the clinical trial in patients in the second half of this year, the company needs to complete development of the scanning hardware and the software interface, which includes selection of the number of antennae and rings to send and receive the signals. The clinical study in patients will also be used to help refine the algorithms for its microwave brain scanner.

*Continued over*

One of the researchers behind the technology, Professor Stuart Crozier from UQ, believes that his group can tune the scattered microwaves better than anyone else to produce an accurate medical image.

It is expected that the quality of images using low energy microwave radiation will not have the definition of a CT scan or MRI, but will provide a safer and more accessible medical imaging modality.

### Competition

Competition to Emvision, as listed in the company's prospectus, includes from EMTensor (Austria/USA), Medfield Diagnostics (Sweden), and Cerebrotech Medical Systems (US). Locally listed group Micro-X (Australia) is also working in this field.

EMTensor, like Emvision, uses microwave energy to gain a 3D image of the brain to detect stroke. The company is commercialising its instrument for use in ambulances to triage stroke patients, as well as for continuous brain imaging for post stroke monitoring. The company was formed in 2012 with the first functional image generated in 2010. It is a direct competitor and most comparable to Emvision. It is more advanced, with the company seeking to launch its product this year.

Medfield Diagnostics is also using microwave energy for stroke diagnosis. The company was founded in 2005. Its Strokefinder instrument is currently in clinical studies. The technology does not provide information on spacial location of the blood clot or bleed in the brain, which can be important to understand the potential damage and to direct invasive treatment when required.

Cerebrotech uses impedance spectroscopy to assess differences in fluid movement between the left and right hand hemispheres of the brain. Its accuracy in detecting large vessel blockages is 92%. It gained CE Mark clearance in Europe at the end of 2017 although appears to have been dormant for the last 12 months.

Micro-X has achieved proof-of-concept with its technology to produce a miniature CT scan that should allow stroke to be detected. The next stage for the company is to build a prototype instrument.

It should be noted that new imaging modalities using microwaves require highly technical, mathematical algorithms. The quality of one microwave imaging system can potentially be distinctly different to that developed by another group. For Emvision, there is some benefit in having two groups more advanced that can help build acceptance and adoption for this new imaging modality.

### Intellectual Property

Emvision has five families of patent applications with four of those applications around system processes and one for the use of a wearable antenna assembly.

According to Emvision's prospectus, a key advantage it has over its competitors is its brain scanner's calculation methods, which are highly complex. Emvision's technology is based on over 10

years of development work at UQ led by Professors Amin Abbosh and Stuart Crozier.

The team at UQ, including Stuart Crozier, had previously developed radar technology for use in the mining industry to assess wall stability. The technology, housed in a company called GroupProbe, was sold to Orica in 2017 for \$205 million. Stuart Crozier has a strong track record in successful imaging work, with his hardware advances in MRI now used in over 65% of all MRI machines.

### Other Applications – Liver Diseases

Emvision is seeking to develop a second instrument, also using microwave imaging technology, to aid in liver disease diagnosis.

The company is at the proof-of-concept phase with its Torso Scanning program to build algorithms to detect high fat levels in the liver for diagnosis of non-alcoholic fatty liver disease (NAFLD), which often leads to NASH (and then liver cirrhosis and liver cancer). The initial liver tissue samples were collected in December last year. Initial data on the study is expected by mid year. With the growing incidence of NAFLD and NASH, this represents a very large market opportunity.

### Stroke Alliance

Last month Emvision was invited to join the newly formed Australian Stroke Alliance, which is run by The Melbourne Brain Centre at the Royal Melbourne Hospital. The ASA is assessing various technologies to implement a more cost-effective and accessible mobile stroke diagnosis system in Australia.

### Summary

Emvision has appointed an experienced CEO, Ron Weinberger, who was formerly CEO of Nanosonics and was instrumental in the commercialisation of that company's Trophon system into the US market.

The company is not alone in developing microwave technology for brain imaging although the scientists developing the instruments for Emvision have a strong and successful track record in delivering major advances in imaging software and hardware.

The key milestones this year for Emvision include yielding positive clinical data from its stroke patient study, and achieving proof-of-concept with its liver scanning program.

Emvision is capitalised at \$22 million and held \$5.8 million in cash at the end of last year.

*Bioshares* recommendation: **Speculative Buy Class B**

**Bioshares**

## The ASX-Listed Life Sciences Sector

### March 31, 2019: Capitalisation \$134.6 billion, 143 companies

#### Bioshares Large Cap. Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
CSL	CSL	88,326	Manufactures pharmaceutical products including vaccines and human plasma fractions	5%	25%	\$194.94
Resmed Inc.	RMD	20,704	Manufactures diagnostic and treatment equipment for sleeping disordered breathing	-9%	17%	\$14.45
Cochlear	COH	10,001	Manufactures cochlear hearing implants	0%	-5%	\$173.28
Blackmores	BKL	1,617	Manufactures vitamin, mineral and herbal supplements and skin & hair products in Australia and N.Z.	-24%	-26%	\$93.13
Mayne Pharma Group	MYX	1,100	Manufactures, develops and markets generic drugs, with operations in Australia and the USA	-10%	-6%	\$0.695

**Capitalisation Total**                      121,748

#### Bioshares Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
Nanosonics	NAN	1,308	Developing a novel disinfection technology, the first product is a point of care ultrasound probe disinfection unit, branded Trophon EPR	54%	70%	\$4.360
Clinuvel Pharmaceuticals	CUV	1,175	Markets an analogue of the alpha-MSH protein, named Scenesse, as a photo-protective agent. Approved in Europe.	35%	147%	\$24.490
API	API	746	Pharmaceutical wholesaler. <b>Merging with Sigma Pharmaceuticals.</b>	10%	1%	\$1.515
Mesoblast	MSB	716	Developing cellular medicines based on its proprietary mesenchymal lineage adult stem cells for high, unmet medical needs including advanced heart failure, chronic low back pain, acute graft versus host disease and inflammatory conditions such as biologic refractory rheumatoid arthritis.	24%	-4%	\$1.435
Sigma Pharmaceuticals	SIG	556	Pharmaceutical manufacturing and wholesaling. <b>Merging with API.</b>	-8%	-33%	\$0.525
Avita Medical	AVH	531	Markets ReCell, a skin repair product	252%	400%	\$0.285
Polynovo	PNV	496	Developing novel polymer-based products for treating wounds and burns	26%	42%	\$0.750
Starpharma Holdings	SPL	355	Developer of pharmaceutical chemical scaffolds known as 'dendrimers'	-19%	-24%	\$0.955
Clovercorp	CLV	342	Development and production of omega-3 food additives from tuna oil	51%	118%	\$2.070
Medical Developments	MVP	326	Commercialising the Pentrox inhaler for temporary pain relief. Used widely in ambulances across Australia.	13%	-29%	\$4.980
Paradigm Biopharm.	PAR	264	Development of existing approved drug, pentosan polysulphate sodium to treat bone marrow oedema and joint pain	80%	550%	\$1.885
Volpara Health Technologies	VHT	251	Markets breast density assessment tools and analytics, for use with breast X-ray screening programs	27%	94%	\$1.400

## Bioshares Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
AFT Pharmaceuticals	AFP	192	Development and sale of pharmaceuticals in Australasia and Rest-of-World	0%	-6%	\$1.975
Telix Pharmaceuticals	TLX	183	Development of molecularly-targeted radiation (MTR) therapies and diagnostics	29%	6%	\$0.840
Opthea	OPT	171	Developing OPT-302 to treat wet AMD (an eye disease)	18%	21%	\$0.685
Cynata Therapeutics	CYP	126	Stell cell technology company aiming to produce unlimited uniform, pharmaceutical grade MSCs from a single donor.	-5%	-10%	\$1.240
Neuren Pharmaceuticals	NEU	117	Developing neuroprotective therapeutics.	-17%	-61%	\$1.160
Genetic Signatures	GSS	114	Development and sale of molecular diagnostics(MDx) kits and products.	38%	340%	\$1.100
Somnomed	SOM	109	Markets oral devices for the treatment of sleep apnea and snoring.	-5%	-43%	\$1.730
Pharmaxis	PXS	104	Markets the lung function test, Aridol. Bronchitol is approved in Europe for the management of cystic fibrosis. Developing a suite of compounds from amine oxidase platform.	0%	-18%	\$0.265
Immutep	IMM	112	Developing immuno-oncology drug candidates IMP761 and IMP321 (eftilagimod alpha)	18%	43%	\$0.033
G Medical	GMV	100	Developing next generation mobile health and e-health devices, and cloud and medical call centres	2%		\$0.275
Probiotec	PBP	94	Manufacturer, marketer and distributor of a range of over the counter (OTC) pharmaceuticals, complementary medicines and speciality ingredients	4%	69%	\$1.570
SDI	SDI	90	Manufacture & distribution of amalgam (fillings) & other dental materials and product R&D	16%	33%	\$0.760
Ellex Medical Lasers	ELX	88	Develops, manufactures and markets solid state ophthalmic lasers used to treat secondary cataracts and retinal disorders.	-12%	-29%	\$0.610
Botanix Pharmaceuticals	BOT	88	Developing BTX1503 for the treatment of acne. BTX1503 combines synthetic cannabidiol with a transdermal drug delivery system, Permetrex.	64%	5%	\$0.115
Compumedics	CMP	82	Develops, manufactures and markets sleep diagnostic and monitoring equipment.	16%	26%	\$0.465
Impedimed	IPD	82	Markets products that aid the diagnosis of secondary lymphoedema, muscle wasting and other disorders	13%	-71%	\$0.215
Cyclopharm	CYC	75	A nuclear medicine company that markets the Technegas lung imaging system	-1%	-8%	\$1.095
Reva Medical	RVA	70	Developing the Fantom scaffold, its third version of a bioresorbable coronary stent. <b>SUSPENDED FROM TRADING</b>	13%	-56%	\$0.170
Imugene	IMU	69	Developing a Her2 positive cancer vaccine technology	6%	-42%	\$0.019
Actinogen Medical	ACW	68	Developing Xanamem for the treatment of dementia in Alzheimer's disease patients	20%	15%	\$0.054
Bionomics	BNO	68	Discovery and development of drugs to treat CNS diseases	19%	-78%	\$0.125

## Bioshares Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
Invion	IVX	66	Development of Photosoft, a photosensitiser derived from chlorophyll, which it is believed can accumulate selectively in tumours and be manipulated for therapeutic purposes.	-33%	-67%	\$0.012
Medadvisor	MDR	63	Medication adherence software platform company	31%	-6%	\$0.046
Phylogica	PYC	61	Developing peptide compound libraries for use in human therapeutics	-11%	-11%	\$0.025
ResApp Health	RAP	60	Developing digital healthcare solutions to diagnose and manage respiratory conditions	-18%	-28%	\$0.086
Osprey Medical	OSP	58	Markets DYEVERT, a device which reduces the amount of dye needed in imaging procedures	17%	-53%	\$0.135
Star Combo Pharma	S66	50	Develops, manufactures and markets nutritional and OTC products	3%		\$0.580
Noxopharm	NOX	49	Developing a cancer treatment, NOX66, a formulation of idronoxil, which targets NADH oxidase 2.	-5%	-56%	\$0.400
Bluechiip	BCT	46	Development, manufacture and commercialisation of a tracking system for biological samples	63%	44%	\$0.088
Vita Life Sciences	VLS	45	Development, manufacture and distribution of prescription and OTC medicines as well as complementary and alternative medicines, dietary supplements and health foods	-15%	12%	\$0.825
Biotron	BIT	45	Developing a drug to treat HIV	-35%	200%	\$0.075
Micro-X	MX1	41	Development of a mobile medical x-ray imager for hospitals, a version for deployed military use and a mobile security back-scatter imager	-9%	-32%	\$0.267
Alcidion	ALC	40	Specialist health IT solution provide. Recently acquired MKM Health and Patient Track Holdings.	44%	67%	\$0.065
Invitrocue	IVQ	39	Singapore-based analytical services company (life sciences)	-4%	-25%	\$0.075
Respiri	RSH	38	Respiratory and pulmonary devices company. Markets Airsona, an ehealth product.	-16%	-11%	\$0.080
Resonance Health	RHT	37	Marketing the FerriScan technology, a non-invasive tool for measuring liver iron levels	53%	338%	\$0.092
IDT Australia	IDT	36	Manufacturer of pharmaceutical ingredients to international standards for major pharmaceutical groups.	3%	88%	\$0.150
Universal Biosensors	UBI	35	Development, manufacture and commercialisation of a range of in vitro diagnostic tests for point-of-care use	-9%	-26%	\$0.200
Oncosil Medical	OSL	34	Developing Oncosil, a brachytherapy for pancreatic cancer and liver cancer	-71%	-58%	\$0.054
Exopharm	EX1	32	Development of technology for improving the purification of exosomes, which are extra-cellular vesicles which transport bioactive molecules through out the body.	-27%	0%	\$0.400
Benitec Biopharma	BLT	32	Developing innovative therapies based on a combination of gene therapy with ddRNAi gene silencing technology	19%	-38%	\$0.125
Acruz	ACR	31	Developer of topical generic drugs	3%	16%	\$0.185

## Bioshares Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
Immuron	IMC	31	Sales and development of hyper-immune bovine colostrum products for therapeutic use	8%	-43%	\$0.215
Asian American Medical Group	AJJ	30	Manages liver treatment centres in Asia; expanding into radiation oncology	-31%	-14%	\$0.090
Oventus	OVN	29	Developing an oral appliance to treat sleep apnea and snoring	0%	-25%	\$0.270
Kazia Therapeutics	KZA	29	Developing GDC-084 for the treatment of glioblastoma multiform (a brain cancer)	26%	-39%	\$0.460
Rhinomed	RNO	28	Developing nasal technologies with applications for sport performance, sleep and drug delivery.	3%	50%	\$0.195
Adalta	1AD	27	Developing AD-114 for the treatment of idiopathic pulmonary fibrosis (IPF) and other human fibrotic diseases	2%	-31%	\$0.235
Cogstate	CGS	27	Markets cognitive performance diagnostic products	-62%	-71%	\$0.230
Mach 7 Technologies	M7T	27	Development and sales enterprise imaging management platform	-12%	-36%	\$0.185
Patrys	PAB	26	Developing novel antibody therapies for a range of oncology indications. Focussed on 3E10, a cell penetrating antibody.	-11%	-41%	\$0.024
Prana Biotechnology	PBT	25	Developing PBT434 for synucleinopathies. Name change to Alterity Therapeutics.	33%	-4%	\$0.044
Admedus	AHZ	25	Markets Cardiocel, a bio-scaffold	-32%	-86%	\$0.042
Anatara Life Sciences	ANR	24	Following the licensing of its animal health product to Zoetis, is now developing a gastrointestinal dietary supplement (human health)	7%	-67%	\$0.490
Proteomics International	PIQ	24	Provider of protein chemistry analytical services. Seeking to commercialise a diabetic kidney disease diagnostic.	-21%	28%	\$0.300
CardieX	CDX	24	Development of wearable blood pressure measurement devices	31%	65%	\$0.038
USCOM	UCM	23	Markets Uscom, a non-invasive heart output function monitor, BP+ non-invasive central blood pressure product and digital ultrasonic spirometry products	17%	-26%	\$0.170
Heramed	HMD	23	Commercialising a home pregnancy monitoring technology	66%	0%	\$0.265
Regeneus	RGS	23	Commercialisation of autologous adipose derived stem cells and factors. Markets HiQCell for human use and CryoShot for veterinary use.	-39%	-8%	\$0.110
Emvision	EMV	22	Exploiting low energy non-ionising microwave radiation to create 3D images, with the goal of developing a device to support the diagnosis of the two main types of stroke	10%	0%	\$0.385
Recce	RCE	21	Development of an antibiotic ("RECCE") as a cancer treatment	14%	38%	\$0.200
Genetic Technologies	GTG	21	A diversified molecular diagnostics company embracing blockchain technologies across genomic testing platforms. Markets Brevagenplus, a breast cancer risk prediction tool.	33%	-11%	\$0.008
Living Cell Technologies	LCT	21	Development of NTCELL for the treatment of Parkinson's Disease, and potentially for eye and ear diseases	-16%	54%	\$0.037

## Bioshares Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
Total Brain	TTB	20	Development and commercialisation of functional brain analysis techniques. Formerly Brain Resource Corp.	-15%	-52%	\$0.028
GI Dynamics	GID	20	Commercialising the Endobarrier, an implantable polymer liner for the management of obesity and diabetes	31%	-25%	\$0.021
Anteo Diagnostics	ADO	20	Developer of a biological coatings technology that can be applied to immunoassays, bio-separations, drug delivery and other medical devices	0%	6%	\$0.017
AirXpanders	AXP	20	Design, manufacture and distributor of the Aeroform, a patient controlled tissue expander, for use in breast reconstruction after mastectomy. <b>SUSPENDED FROM TRADING</b>	35%	-92%	\$0.035
Cellmid	CDY	19	Develops and markets therapies and diagnostic tests for fibrotic diseases, cancer, ischemic diseases of the heart and hair loss.	-21%	-53%	\$0.220
Optiscan Imaging	OIL	18	Manufactures confocal microscopes for clinical diagnosis	-7%	-44%	\$0.042
Genera Biosystems	GBI	17	Develops, manufactures and distributes advanced molecular diagnostic tests, with a particular focus on women's health. <b>SUSPENDED SINCE JULY 2018</b>	0%	0%	\$0.160
Visioneering Technologies	VTI	17	Markets a next-generation contact lens	-55%	-84%	\$0.069
Rhythm Biosciences	RHY	16	Developing Colostat, a blood test for the early detection of colorectal cancer	14%	-16%	\$0.160
Sienna Cancer Diagnostics	SDX	16	Development and sale of an in vitro diagnostic, SCD-A7, as an adjunct to urine cytology, in the field of bladder cancer detection and diagnosis	10%	-34%	\$0.066
Antisense Therapeutics	ANP	16	Developing antisense compounds to treat multiple sclerosis and Duchenne Muscular Dystrophy	46%	3%	\$0.038
Holista Colltech	HCT	16	Extracts collagen from sheepskins and markets natural healthcare products.	17%	-41%	\$0.068
BARD1 Life Sciences	BD1	16	Developing cancer diagnostics and therapies. Lead program is the BARD1 lung cancer test. Acquired Swiss company BARD1AG.	-27%	-11%	\$0.016
Orthocell	OCC	15	Developing and marketing regenerative medicine products	-3%	-54%	\$0.140
LBT Innovations	LBT	15	Developer of innovative products which deliver productivity benefits across a range of life science settings	-15%	-49%	\$0.076
Dimerix	DXB	14	Developing a combination therapy, DMX200, to treat chronic kidney disease.	-3%	-25%	\$0.086
Bioxyne	BXN	13	Sale and distribution of probiotics	-36%	-74%	\$0.021
Analytica	ALT	13	Markets the Pericoach product to aid in the management of female urinary incontinence.	-20%	-33%	\$0.004
Prescient Therapeutics	PTX	12	Developing compounds to treat various cancers	-28%	-52%	\$0.050
Allegra Orthopeadics	AMT	12	A developer and manufacturer of prosthetic implants and medical devices.	-40%	0%	\$0.120
Bio-Gene Technology	BGT	12	Commercialisation of the insecticides Flavocide (synthetic) and Qcide (plant-derived), in the fields of human health and crop protection.	-1%		\$0.099

## Bioshares Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
Vectus Biosystems	VBS	11	Developing an anti-fibrotic compound, VB0004, with applications in heart and kidney disease	-24%	-62%	\$0.450
Suda Pharmaceuticals	SUD	10	Developing drugs for oro-mucosal administration. Recently acquired IP for anagrelide, with intent to develop it as an anti-cancer therapy	-33%	-71%	\$0.004
StemCell United	SCU	10	Applies a proprietary stem cell technology to culture and grow plant extracts for use in Traditional Chinese Medicine.	5%	-43%	\$0.020
Neuroscientific Biopharm.	NSB	10	Developing EmtinB, an LRP-1 receptor agonist for the treatment of Alzheimer's disease	38%		\$0.180
TBG Diagnostics	TDL	9	Development of HLA SSA and SBT diagnostic kits and related services	-30%	-39%	\$0.040
Memphasys	MEM	8	Developing a sperm separation technology, SpermSep. Completed a 1:15 share consolidation.	-18%	-23%	\$0.023
Dorsavi	DVL	8	Commercialising a wireless sensor movement monitoring system and products for use in the Elite Sports, OH&S and medical/physiotherapy markets	-34%	-80%	\$0.041
Imagion Biosystems	IBX	8	Developing MagSense, a diagnostic technology which exploits the principles of superparamagnetic relaxometry	-17%	0%	\$0.025
PharmAust	PAA	8	Developing a veterinary anti-parasitic compound (PPL-1) as a human and animal cancer therapy. Also operates Epicchem, a medicinal chemistry service business.	-5%	-33%	\$0.038
Novita Healthcare	NHL	7	Design and development of training exercises that target core issues in early childhood and academic skills. Acquired Newly, and online matching marketplace which connects	-31%	-41%	\$0.020
Race Oncology	RAC	7	Completing the development of a chemotherapy drug, called Bisantrene, which was the subject of more than 40 phase II clinical studies during the 1980s and 1990s.	16%	-76%	\$0.087
Simavita	SVA	7	Commercialising an incontinence assessment technology. <b>SUSPENDED FROM TRADING</b>	-11%	-26%	\$0.017
Amplia Therapeutics	ATX	6	Developing drug candidates to treat fibrotic cancers and fibrosis. Formerly Innate Immunotherapeutics.	0%	-82%	\$0.140
Jayex Healthcare	JHL	6	Commercialisation of the Enlighten patient workflow platform	84%	119%	\$0.035
Adherium	ADR	5	Commercialising personal digital medication monitoring systems to improve patient compliance and medication efficacy	-24%	-83%	\$0.028
Phosphagenics	POH	5	Commercialising a platform technology (alpha-tocopherol) , for human and animal applications.	-40%	-77%	\$0.003
Medibio	MEB	4	Commercialising a test for depression and anxiety	-19%	-92%	\$0.017
Lifespot Health	LSH	4	Acquired Lifespot AG, which has been developing a system for the diagnosis and evaluation of skin diseases, and BodyTel AG, which has been developing a system for the	-10%	-60%	\$0.054
Medigard	MGZ	3	Developing an injectable drug KT009 (endogenous recombinant protein GDF-6) to treat intervertebral disc degeneration. <b>SUSPENDED FROM TRADING</b>	0%	18%	\$0.020

## Bioshares Index

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
Factor Therapeutics	FTT	3	Business under review following the failure of wound therapy VT001 to meet endpoints in Phase II trial	50%	-93%	\$0.003
Cryosite	CTE	2	Provides specialised storage services, especially for umbilical cord blood	0%	-61%	\$0.045
OBJ	OBJ	2	Developing transdermal drug delivery technologies	0%	-38%	\$0.018
Neurotech International	NTI	2	Development and sales of Mente (and platform), a treatment for improving behaviours of people with autism and other neurological conditions	-64%	-91%	\$0.016

**Capitalisation Total**                      **11,217**

## Listed Biotech Investment Funds or Companies

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
BTC Health	BTC	15	Provides capital and management expertise to high-growth Australian biotech, medtech and pharmaceutical companies	-18%	11%	\$0.115

**Capitalisation Total**                      **15**

*Continued over*

**Botanical Product Companies (Cultivated Production)**

Company	Code	Cap. \$m	Principal Activities	Change - Quarter	Change - Year	Price 31/3/19
Elixinol Global	EXL	565	A supplier of hemp and medicinal cannabis products	82%		\$4.540
Cann Group	CAN	321	Medicinal cannabis company focused on the breeding, cultivation and production stages. Holds Australian ODC cultivation (MC) and research license (CR).	12%		\$2.300
Auscann Group Holdings	AC8	114	Developing medical cannabis products for the Australian market. Holds Australian ODC cultivation (MC) and manufacture license and TGA manufacture license.	-36%	-76%	\$0.370
TPI Enterprises	TPE	97	Licensed poppy producer. Narcotic raw material processor. Holds Australian ODC cultivation (MC) and research license (CR).	4%	-21%	\$1.200
Medlab Clinical	MDC	78	Development, production and marketing of nutraceuticals. Also developing cannabis product to treat cancer patients with intractable pain.	0%	-38%	\$0.370
THC Global Group	THC	73	A medicinal cannabis company formed through the acquisition of Canndeo, an off-shoot of Agri Fibre Industries. Holds Australian ODC cultivation (MC) and	23%	6%	\$0.570
Althea Group	AGH	69	Supply of branded medicinal cannabis products in Australia. To cultivate, extract and manufacture medicinal cannabis. Holds ODC manufacturing license.	47%	0%	\$0.360
Cann Global	CGB	60	To acquire 100% of Medcan Australia and 100% of Medical Cannabis Ltd. Medcan Australia has been granted an export and import license by the ODC. Relisting expected in 2019.	0%		\$0.037
MMJ Phytotech	MMJ	55	Developing medical cannabis products for the Canadian market	2%	-34%	\$0.240
MGC Pharmaceuticals	MXC	42	A medical and cosmetic cannabis company with growing operations in Slovenia. Acquired Czech company Panax Pharma.	-13%	-59%	\$0.035
Creso Pharma	CPH	42	Development of cannabis and hemp derived therapeutic, nutraceutical, and life style products with wide patient and consumer reach for human and animal health.	-27%	-52%	\$0.360
Zelda Therapeutics	ZLD	40	A medical cannabis company researching treatments for cancer, dermatological indications and for sleep disorders	2%	-50%	\$0.053
Bod Australia	BDA	26	Developer and distributor of natural, evidence-based cosmetics and natural medicines. Holds medicinal cannabis import license. Overseas partner is Linnea SA.	-5%	-4%	\$0.370
Impression Healthcare	IHL	13	Seeking to obtain Commonwealth and state licenses to import, store, distribute and export medicinal cannabis, while diversifying from its dental products business	50%		\$0.024
CannPal Animal Therap.	CP1	11	Research and development of cannabis-based therapeutics for companion animals	-11%		\$0.120
Affinity Energy and Health	AEB	9	Investor in Uruguayan company Biogenics. Has applied to the Australian ODC to cultivate and produce medicinal cannabis. <b>SUSPENDED FROM TRADING</b>	-31%		\$0.009
Fiji Kava	FIJ	6	Cultivation and development of kava (piper methysticum) as an alternative treatment for anxiety, pain and insomnia.	-33%		\$0.080
eSense Health	ESE	4	Specialises in phytochemical profiling of plants to develop and reverse engineer terpenes for medical and other applications.	-15%		\$0.023

**Capitalisation Total** 1,625

**Capitalisation Total - All Indices** 134,605

**How Bioshares Rates Stocks**

For the purpose of valuation, Bioshares divides biotech stocks into two categories. The first group are stocks with existing positive cash flows or close to producing positive cash flows. The second group are stocks without near term positive cash flows, history of losses, or at early stages of commercialisation. In this second group, which are essentially speculative propositions, Bioshares grades them according to relative risk within that group, to better reflect the very large spread of risk within those stocks. For both groups, the rating “Take Some Profits” means that investors may re-weight their holding by selling between 25%-75% of a stock.

**Group A**

Stocks with existing positive cash flows or close to producing positive cash flows.

- Buy** CMP is 20% < Fair Value
- Accumulate** CMP is 10% < Fair Value
- Hold** Value = CMP
- Lighten** CMP is 10% > Fair Value
- Sell** CMP is 20% > Fair Value  
(CMP–Current Market Price)

**Group B**

Stocks without near term positive cash flows, history of losses, or at early stages commercialisation.

**Speculative Buy – Class A**

These stocks will have more than one technology, product or investment in development, with perhaps those same technologies offering multiple opportunities. These features, coupled to the presence of alliances, partnerships and scientific advisory boards, indicate the stock is relative less risky than other biotech stocks.

**Speculative Buy – Class B**

These stocks may have more than one product or opportunity, and may even be close to market. However, they are likely to be lacking in several key areas. For example, their cash position is weak, or management or board may need strengthening.

**Speculative Buy – Class C**

These stocks generally have one product in development and lack many external validation features.

**Speculative Hold – Class A or B or C**

**Sell**

**Corporate Subscribers:** Cogstate, Bionomics, LBT Innovations, Opthea, ResApp Health, Pharmaxis, Dimerix, Adalta, Actinogen Medical, Patrys, Cyclopharm, Emvision, Antisense Therapeutics

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