Neuroscience Investment: Challenges & Outlook

Jamie Munro
BIO, Boston, MA, USA
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Jamie Munro leads the Portfolio & Licensing practice at Clarivate Analytics including heading up CMR International, the R&D benchmarking service. Dr Munro has significant life science experience including over 15 years large pharma experience as well as a PhD in Finance.

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Neuroscience Investment

Recent setbacks and unmet need
### Recent late-stage AD failures

<table>
<thead>
<tr>
<th>Molecule</th>
<th>MoA</th>
<th>Company</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>atabecestat</td>
<td>BACE inhibitor</td>
<td>J&amp;J</td>
<td>May 2018</td>
</tr>
<tr>
<td>verubecestat</td>
<td>BACE inhibitor</td>
<td>Merck &amp; Co.</td>
<td>Feb 2018/Feb 2017</td>
</tr>
<tr>
<td>BAN2401</td>
<td>anti-amyloid beta mAb</td>
<td>Biogen</td>
<td>Dec 2017</td>
</tr>
<tr>
<td>intepirdine</td>
<td>5-HT6 antagonist</td>
<td>Axovant Sciences</td>
<td>Dec 2017/Sep 2017</td>
</tr>
<tr>
<td>idalopirdine</td>
<td>5-HT6 antagonist</td>
<td>Lundbeck/Otsuka</td>
<td>Feb 2017/Sep 2016</td>
</tr>
<tr>
<td>solanezumab</td>
<td>anti-amyloid beta mAb (soluble Aβ)</td>
<td>Eli Lilly</td>
<td>Nov 2016</td>
</tr>
<tr>
<td>BI-409306</td>
<td>PDE9 inhibitor</td>
<td>Boehringer Ingelheim</td>
<td>Sep 2016</td>
</tr>
</tbody>
</table>

Aβ=amyloid beta, AD=Alzheimer’s disease, mAb=monoclonal antibody
New neuroscience drugs are making it to market

Neuroscience NME approvals by FDA

- 2008: 8
- 2009: 5
- 2010: 5
- 2011: 6
- 2012: 4
- 2013: 5
- 2014: 8
- 2015: 6
- 2016: 5
- 2017: 8
- 2018: 2

Average

Actual/Forecast Sales for NME Neuroscience FDA Approvals

- Multiple sclerosis: 8%
- Other with sales >$1B: 12%
- Sales <$1B: 80%

Source: FDA, Cortellis Competitive Intelligence, Clarivate analysis

* As of 24th May 2018
Although large unmet medical need remains for Alzheimer’s Disease

Source: IPD, NCBI, NIH.gov health statistics, Alzheimer’s Disease Association

1 Memantine approved in Europe in 2002 and in Japan in 2011
Burden of disease due to dementia out-pacing most other disorders

Americas, 2015: Total DALYs 274,813,000

Americas, % change in DALYs 2015 vs 2000

Source: WHO Global Health Estimates Summary Tables, 2000 and 2015
Only 31 neurological/psychiatric medicines on WHO Essential Drugs List

- acetylsalicylic acid
- amitriptyline
- atracurium
- biperiden
- carbamazepine
- chlorpromazine
- clomipramine
- codeine
- diazepam
- fentanyl
- fluoxetine
- fluphenazine
- haloperidol
- ibuprofen
- lamotrigine
- levodopa + carbidopa
- lithium carbonate
- lorazepam
- magnesium sulfate
- midazolam
- morphine
- neostigmine
- nicotine replacement therapy (NRT)
- paracetamol
- phenobarbital
- phenytoin
- propranolol
- risperidone
- suxamethonium
- valproic acid (sodium valproate)
- vecuronium

Complementary List:
- ethosuximide
- methadone
- pyridostigmine
- clozapine
Industry Overview
Revenues have outpaced the number of new medicines and R&D costs

Source: www.fda.gov

Source: CMR, 2017. 2006 = 100
Increase in a approvals, but drugs are targeting fewer patients

US FDA CDER NME approvals

- 2010: 21
- 2017: 46

Patients covered by approved indications (M)\(^1\)

- 2010: 190
- 2017: 154

Source: FDA, IPD, Clarivate Analytics analysis
\(^1\) Epidemiology data from IPD and published scientific literature
Analysis suggests large pharma ROI has been falling year on year

Source: Deloitte, December 2017
But an orphan NME approval is not the end of the story

Incremental growth in eligible patients for treatment with Keytruda (2014-2017)*

Source: IPD, NCI Cancer Stat Facts, and various publications

* Patient number estimates are based on the prevalence of the cancer in the US. Assumptions have been made with regard to the proportion of patients eligible for Keytruda therapy (stage of disease, line of therapy, etc.)
Large pharma revenues have been driven by older products

Sales from products approved in last five years (2013-2017)

Sales from products approved in last five years as % total pharma sales

Established products are driving sales

Off-patent sales as % total sales (2017)

Sources: Clarivate Analytics 2018
Approvals data from Cortellis Regulatory Intelligence and FDA
Product and company sales data from company Annual Reports/20-F or 10-K filings
Patent expiry data from company reports (as above) and Newport
Exchange rates from www.x-rates.com
No subsector has cracked the code on productivity

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| Cost breakdown of combined industry profit and loss,¹ by industry subsector, % |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Cost of goods sold              | Selling, general,              | R&D                             | Depreciation and                | Earnings before interest and    |
|                                  | and administrative             |                                 | amortization                    | taxes                           |
| Healthcare conglomerates        |                                |                                 |                                |                                 |
| $214 billion                    | $214 billion                   |                                 |                                 |                                 |
|                                | 28                              | 29                              |                                 |                                 |
|                                | 30                              | 29                              |                                 |                                 |
|                                | 13                              | 13                              |                                 |                                 |
|                                | 6                               | 6                               |                                 |                                 |
|                                | 23                              | 23                              |                                 |                                 |
| 2011                            | 2014                            | 2011²                           | 2014                            | 2011                            |
| Big pharma (excluding           |                                |                                 |                                |                                 |
| conglomerates)                  |                                |                                 |                                |                                 |
| $346 billion                    | $324 billion                   |                                 |                                 |                                 |
|                                | 19                              | 19                              |                                 |                                 |
|                                | 25                              | 26                              |                                 |                                 |
|                                | 10                              | 9                               |                                 |                                 |
|                                | 8                               | 9                               |                                 |                                 |
|                                | 30                              | 27                              |                                 |                                 |
| Midcap pharma¹                  |                                |                                 |                                |                                 |
| $190 billion                    | $202 billion                   |                                 |                                 |                                 |
|                                | 27                              | 27                              |                                 |                                 |
|                                | 31                              | 28                              |                                 |                                 |
|                                | 17                              | 19                              |                                 |                                 |
|                                | 6                               | 6                               |                                 |                                 |
|                                | 20                              | 22                              |                                 |                                 |
| Generic origin companies        |                                |                                 |                                |                                 |
| $59 billion                     | $73 billion                    |                                 |                                 |                                 |
|                                | 45                              | 41                              |                                 |                                 |
|                                | 25                              | 27                              |                                 |                                 |
|                                | 5                               | 6                               |                                 |                                 |
|                                | 6                               | 6                               |                                 |                                 |

¹Includes small molecules and biotechs.
²Figures may not sum, because of rounding.

Source: McKinsey, Jan 2017
Growth forecast for global Neuroscience market versus Oncology

Forecast neuroscience sales growth of top 20 pharmas with CNS sales ($M)$

Forecast oncology sales growth of top 20 pharmas with oncology sales ($M)$

1 “Central Nervous System (CNS) Therapeutic Market Analysis By Disease (Neurovascular, Trauma, Mental Health, Degenerative Disorder [Alzheimer’s Disease, Parkinson’s Disease, Multiple Sclerosis], Infections, Cancer), & Segment Forecasts, 2016 – 2025”, Grand View Research, July 2017

2 “Top 20 pharma companies by CNS sales”, PMLive, http://www.pmlive.com/top_pharma_list/cns_revenues (data from Global Data – includes Rx and generics)

3 “Top 20 pharma companies by oncology sales”, PMLive, http://www.pmlive.com/top_pharma_list/oncology_revenues (data from Global Data – includes Rx and generics)

Regulatory environment challenging

(a) Median approval time (days): 2013-2017

(b) % approvals with expedited review: 2013-2017

(c) Approval time by TA for 6 regulatory authorities: 2013-2017 (ordered by fastest agency median approval time within each TA)

‘Expedited review’ refers to EMA ‘Accelerated Assessment’ and FDA/PMDA ‘Priority Review. Approval time is calculated from the date of submission to the date of approval by the agency. This time includes agency and company time. EMA approval time includes the EU Commission time.

‘Nervous System’ includes anaesthetics, analgesics, antiepileptics, anti-parkinson drugs, psycholeptics, psychoanaleptics, and “other nervous system”

Data includes new active substances only.
Neuroscience success rates lower than most other therapy areas, especially in early development

Probability of Launch by Therapeutic Area: 2010-2016

Source: CMR. Probability of Launch from stage shown for Active Substances for Decisions Made 2010-2016 by Therapeutic Area, using Progression Decision Methodology
Illustrative Implications

- Assuming costs of one successful NS drug of $365m
- Would yield total costs of $4.6bn including costs of failure
- Assuming R&D: Sales of 25% and hub costs of $0.4bn would require revenues of $20bn
- Would require a blockbuster with PYS of $1.8bn+
Neuroscience Investment

General Snapshot
Number of neurological medicines in development increased in last 3 years, driven by cancer and Alzheimer’s disease. Companies back out of pain and multiple sclerosis.
Neuroscience remains an active area for R&D

Data extracted from Cortellis for Competitive Intelligence and cover all development programs captured as of Dec 31, 2017
Most research directed at neurological disease
Greatest focus on pain and Alzheimer’s disease

Psychiatric disorders 15% : Neurological disease 85%

- Psychotic disorder 4%
- Mood disorder 4%
- Drug dependence 4%
- Anxiety 2%
- Other neurological 10%
- Huntington's chorea 2%
- Epilepsy 3%
- Movement disorders 4%
- Multiple sclerosis 5%
- Cerebrovascular disease 5%
- Neuromuscular disease 7%
- Parkinson's disease 7%
- Neuropathy 7%
- Alzheimer's disease 14%
- Pain 19%
- Other psychiatric 2%
- Anxiety 2%
- Drug dependence 4%
- Mood disorder 4%
- Other neurological 10%
- Huntington's chorea 2%
- Epilepsy 3%
- Movement disorders 4%
- Multiple sclerosis 5%
- Cerebrovascular disease 5%
- Neuromuscular disease 7%
- Parkinson's disease 7%
- Neuropathy 7%
- Alzheimer's disease 14%
- Pain 19%
- Other psychiatric 2%

Data extracted from Cortellis for Competitive Intelligence. Programs with an active indication of neurological disease or psychiatric disorder in development (discovery through registration) as of Mar 2, 2018
## Pharma companies with core neuroscience R&D: 2008 vs 2018

<table>
<thead>
<tr>
<th>Company</th>
<th>2008</th>
<th>→</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbott/AbbVie</td>
<td>✓</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>Allergan</td>
<td>X</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>Amgen</td>
<td>✓</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>Biogen</td>
<td>✓</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>Novartis</td>
<td>✓</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>Roche</td>
<td>✓</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>Takeda</td>
<td>✓</td>
<td>↑</td>
<td>✓</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>UCB</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>AstraZeneca</td>
<td>✓</td>
<td>↓</td>
<td>X</td>
</tr>
<tr>
<td>Bayer</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Bristol-Myers Squibb</td>
<td>✓</td>
<td>↓</td>
<td>X</td>
</tr>
<tr>
<td>GlaxoSmithKline</td>
<td>✓</td>
<td>↓</td>
<td>X</td>
</tr>
<tr>
<td>Eli Lilly</td>
<td>✓</td>
<td>↓</td>
<td>✓</td>
</tr>
<tr>
<td>Merck &amp; Co</td>
<td>✓</td>
<td>↓</td>
<td>✓</td>
</tr>
<tr>
<td>Pfizer</td>
<td>✓</td>
<td>↓</td>
<td>X</td>
</tr>
<tr>
<td>Sanofi</td>
<td>✓</td>
<td>↓</td>
<td>✓</td>
</tr>
<tr>
<td>Wyeth</td>
<td>✓</td>
<td>↓</td>
<td>X</td>
</tr>
</tbody>
</table>

**BUILD/ENTER:**
- Abbott/AbbVie
- Allergan
- Amgen
- Biogen
- Novartis
- Roche
- Takeda

**MAINTAIN:**
- Johnson & Johnson
- UCB

**REDUCE/EXIT:**
- AstraZeneca
- Bayer
- Bristol-Myers Squibb
- GlaxoSmithKline
- Eli Lilly
- Merck & Co
- Pfizer
- Sanofi
- Wyeth
Other top-ranked biopharmaceutical companies and neuroscience interest

<table>
<thead>
<tr>
<th>Company</th>
<th>R&amp;D Q3 2017 (USD M)</th>
<th>Neuro?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celgene</td>
<td>3,177</td>
<td>✔</td>
</tr>
<tr>
<td>Gilead</td>
<td>2,584</td>
<td>✗</td>
</tr>
<tr>
<td>Regeneron</td>
<td>1,547</td>
<td>✗</td>
</tr>
<tr>
<td>Shire</td>
<td>1,324</td>
<td>✔</td>
</tr>
<tr>
<td>Vertex</td>
<td>1,018</td>
<td>✔</td>
</tr>
<tr>
<td>Incyte</td>
<td>879</td>
<td>✗</td>
</tr>
<tr>
<td>Alexion</td>
<td>798</td>
<td>✔</td>
</tr>
<tr>
<td>BioMarin</td>
<td>442</td>
<td>✔</td>
</tr>
<tr>
<td>Seattle Genetics</td>
<td>346</td>
<td>✗</td>
</tr>
<tr>
<td>Alkermes</td>
<td>308</td>
<td>✔</td>
</tr>
<tr>
<td>Alnylam</td>
<td>273</td>
<td>✗</td>
</tr>
<tr>
<td>Ionis</td>
<td>246</td>
<td>✔</td>
</tr>
<tr>
<td>Agios</td>
<td>215</td>
<td>✗</td>
</tr>
<tr>
<td>Tesaro</td>
<td>211</td>
<td>✗</td>
</tr>
<tr>
<td>Alder</td>
<td>208</td>
<td>✔</td>
</tr>
<tr>
<td>Horizon</td>
<td>194</td>
<td>✔</td>
</tr>
<tr>
<td>Nektar</td>
<td>187</td>
<td>✔</td>
</tr>
</tbody>
</table>

1: Q3 2017 total R&D spend (USD M)
ADHD=Attention deficit disorder, AD=Alzheimer’s disease, BPD=Borderline personality disorder, IVH=Intraventricular haemorrhage, MS=Multiple sclerosis, CNP2=Neuronal ceroid lipofuscinosis type 2
External assets make up a significant % of approvals

US FDA CDER NME approvals resulting from licensing/acquisition (2010-2017)
Neuroscience Investment

Neuroscience deal-making
Neuroscience is an active area for deal-making, although well below the level for oncology

<table>
<thead>
<tr>
<th>Number of buy-side transactions by therapy area for top pharma dealmakers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oncology</strong></td>
</tr>
<tr>
<td>J&amp;J</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td><strong>Neuroscience</strong></td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td><strong>Immune/Inflam</strong></td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td><strong>Infectious</strong></td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td><strong>Gastro</strong></td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td><strong>Diversified</strong></td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td><strong>Endo/Met</strong></td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td><strong>Ophthalm</strong></td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td><strong>Cardiology</strong></td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td><strong>Musculoskel</strong></td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td><strong>Respiratory</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td><strong>Hematology</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td><strong>Dermatology</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

Source: Cortellis Deals Intelligence
Covers key transactions types, M&As, Licenses/joint ventures, Research-only deals, and Other (Asset Purchases, Equity Stakes, Spin-outs), with identifiable therapeutic focus areas. Covers all technologies.
Not shown: Other, Genitourinary, Toxicity, Unknown and Not Applicable therapy area deals.
Companies are those among the top 50 pharmaceutical companies who announced 5 or more buy-side transactions in 2017
Neuroscience deal volume has risen steadily, although value is variable

Trends in Neuroscience Licensing/JV/Research only deals

Source: Cortellis Deals Intelligence Clarivate analysis, BioWorld
Recent M&A activity is down

Volume Breakdown by Rx Area of 2016 vs. 2017 M&As with known therapeutic focus

Analysis covers M&A transactions with an identifiable core therapeutic focus.
Not shown are TAs for which there were ≤5 M&As announced in 2017: Hematology, Gastroenterology, Toxicity, Respiratory & Endo/Met

Source: Cortellis Deals Intelligence, Clarivate analysis
Meanwhile, level of VC investment has increased significantly.

**Value of neuroscience US VC investments ($M)**

- 2012-2016: neuroscience $5000M, oncology $3000M

**Neurology vs Psychiatry: Total 2016 US VC investment of $689M**

- Neurology: 92%
- Psychiatry: 8%

**Biopharma Financing in 2017 by Therapeutic Area**

- Cancer: IPOs & Follow-Ons $20000M, Venture Funding $5000M, Public-Other $3000M
- Neurology/Psychiatry: IPOs & Follow-Ons $15000M, Venture Funding $10000M, Public-Other $5000M

Source: "Emerging Therapeutic Company Investments: Neurology/Psychiatric Market Report - 2017"
Similar message with regard to government funding

NIH funding ($M) for Various Research, Condition, and Disease Categories (RCDC)

<table>
<thead>
<tr>
<th>Disease Area</th>
<th>FY 2013</th>
<th>FY 2017 (enacted)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>5,274</td>
<td>6,032</td>
<td>+14%</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>5,340</td>
<td>6,743</td>
<td>+26%</td>
</tr>
</tbody>
</table>

NIH funding ($M) for Alzheimer's Disease (incl. AD-related dementias)

Source: NIH
Promising forthcoming neuroscience therapies¹

<table>
<thead>
<tr>
<th>Molecule</th>
<th>Company</th>
<th>Phase</th>
<th>Launch</th>
</tr>
</thead>
<tbody>
<tr>
<td>inotersen (antisense RNA modulator)</td>
<td>Ionis Pharmaceuticals</td>
<td>Filed</td>
<td>Launch 2018</td>
</tr>
<tr>
<td>NurOwn® (neurotrophic factor-producing mesenchymal stem cell therapy)</td>
<td>Brainstorm Cell Therapeutics</td>
<td>P3</td>
<td>Canada 2018</td>
</tr>
<tr>
<td>APL-130277 (apomorphine sublingual film)</td>
<td>Aquestive Therapeutics/Sunovion Pharmaceuticals</td>
<td>Filed</td>
<td>Launch 2019</td>
</tr>
<tr>
<td>AVXS-101 (gene therapy)</td>
<td>AveXis</td>
<td>P3</td>
<td>Launch 2019</td>
</tr>
<tr>
<td>NKTR-181 (opioid mu receptor agonist)</td>
<td>Nektar Therapeutics</td>
<td>P3</td>
<td>Launch 2019</td>
</tr>
<tr>
<td>ZX008 (fenfluramine low dose)</td>
<td>Zogenix</td>
<td>P3</td>
<td>Launch 2019</td>
</tr>
<tr>
<td>fosmetpantotenate (prodrug)</td>
<td>Retrophin</td>
<td>P3</td>
<td>Launch &gt; 2019</td>
</tr>
<tr>
<td>galcanezumab (anti-CGRP antibody)</td>
<td>Eli Lilly</td>
<td>P3</td>
<td>2018 for migraine (2020 for cluster)</td>
</tr>
<tr>
<td>rapastinel (NMDA partial agonist)</td>
<td>Allergan</td>
<td>P3</td>
<td>Launch &gt; 2020</td>
</tr>
<tr>
<td>Toca 511 &amp; Toca FC (vocimagene amiretro repvec flucytosine gene therapy)</td>
<td>Tocagen</td>
<td>P3</td>
<td>Launch &gt; 2020</td>
</tr>
<tr>
<td>esketamine (NMDA antagonist)</td>
<td>Janssen</td>
<td>P3</td>
<td>Launch &gt; 2021</td>
</tr>
<tr>
<td>aducanumab (anti-beta-amyloid antibody) *</td>
<td>Biogen/Eisai</td>
<td>P3</td>
<td>Launch &gt; 2022</td>
</tr>
</tbody>
</table>

* Consensus forecast > $1Bn by 2023

¹Late-stage development programmes with US FDA Fast Track designation
Neurological devices

US FDA Medical Device Approvals by Advisory Committee: 2013-2017

- Total no. approvals
- Median approval time (days)

Source: Cortellis Regulatory Intelligence, Clarivate analysis
Digital health

- Machine learning is helping advance the prediction of patterns from complex data sets.
- Hardware and computational advances are also generating enhanced visualization in medical imaging.
- The proliferation of smartphones and the advent of linked wearable devices are facilitating data collection and promoting cost-effectiveness of clinical trials.
- Continual real-time monitoring of patients will open up the possibility of linking clinical outcomes to real-world patient behaviour.
- Progress is being made toward continuous, auto-correcting, minimally-invasive, or “closed loop” therapies for neurological disease.
Neuroscience Investment

AD development and learnings from oncology
Alzheimer’s clinical research heavily concentrated on beta amyloid

Source: Cortellis Competitive Intelligence. All molecules with active clinical (P1 through registration) projects directed at Alzheimer’s Disease included
Oncology has benefited from a decade of prioritized investment

Increase in novel oncology FDA approvals

1 Cortellis Competitive Intelligence consensus sales forecasts
2 American Cancer Society
3 Cancer Research UK
Immuno-oncology activity is increasing with ~250 compounds in active development

<table>
<thead>
<tr>
<th>Compound</th>
<th>Target</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>elotuzumab</td>
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<td>CTLA4</td>
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<td>atezolizumab</td>
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<tr>
<td>nivolumab</td>
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<tr>
<td>pembrolizumab</td>
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<tr>
<td>avelumab</td>
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</tr>
</tbody>
</table>

Source: Clarivate Analytics Cortellis Competitive Intelligence, Data extracted in June 2017
Summary

- Despite high profile exits of some large pharma companies, neuroscience investment remains strong.

- An effective Alzheimer’s therapy remains the holy grail, but there are reasons for optimism.

- Advances in Alzheimer biomarkers.

- In preventing neurodegeneration, there is clear rationale for earlier treatment. Such studies now underway.

- Current clinical repertoire biased toward $\alpha$ hypothesis: greater diversity of experimental approaches required.

- Therapies aimed at nerve regeneration versus degeneration prevention have begun to enter clinical testing.

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1 Yanagisawa K et al, Nature 554: 249–254, 8 February 2018
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- Asset re-profiling

- Strategy
- Commercial Assessments
- Prioritisation

- Business Development & Licensing
- Competitive Intelligence
- CMR

- Landscaping
- Dashboards
- Ad hoc reports

- Biopharmaceutical benchmarking
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• With more than 20 years of experience of Biopharmaceutical Benchmarking

• CMR works closely with 80% of Top 20 & 76% of Top 50 pharmaceutical companies (measured by R&D expenditure) to assess R&D & Clinical productivity and provide actionable data and insights

• CMR currently runs a number of benchmarking programmes
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