Extending Our Leadership Position in Multiple Sclerosis

December 12, 2018
Forward-Looking Statements

This presentation contains forward-looking statements, including statements relating to: our strategy and plans; clinical trials and data readouts and presentations; the timing and status of current and future regulatory filings; potential regulatory approval and the timing thereof; the potential benefits, safety, and efficacy of BIIB098 (dixromiel fumarate), opicinumab, extended interval dosing (EID) TYSABRI, an intermuscular formulation of PLEGRIDY®; BIIB061, and BIIB107; the design, enrollment, and timing of the Phase 3b NOVA study of EID TYSABRI; the design, enrollment, and timing of the Phase 3 study of BIIB098 (dixromiel fumarate); the design and timing of the Phase 2b study of opicinumab; the design and timing of the planned Phase 2 study of BIIB061; results from certain studies of BIIB098 (dixromiel fumarate), opicinumab, EID TYSABRI, an intermuscular formulation of PLEGRIDY® and BIIB061; the identification and treatment of multiple sclerosis; potential of our commercial business and pipeline programs; uncertainties associated with drug development and commercialization; capital allocation and investment strategy; and anticipated benefits and potential of investments, collaborations, and business development activities. These forward-looking statements may be accompanied by such words as “aim,” “anticipate,” “believe,” “could,” “estimate,” “expect,” “forecast,” “goal,” “intend,” “may,” “plan,” “potential,” “possible,” “will,” and other words and terms of similar meaning. Drug development and commercialization involve a high degree of risk, and only a small number of research and development programs result in commercialization of a product. Results in early stage clinical trials may not be indicative of full results or results from later stage or larger scale clinical trials and do not ensure regulatory approval. You should not place undue reliance on these statements or the scientific data presented.

These statements involve risks and uncertainties that could cause actual results to differ materially from those reflected in such statements, including: we may not fully enroll our clinical trials or it will take longer than expected; the actual timing and final results of our clinical trials; the risk that unexpected concerns may arise from additional data or analysis, or regulatory authorities may require additional data or information or further studies, or may fail to approve, or refuse to approve, or may delay approval of our drug candidates; uncertainty of success and timing in the development and potential commercialization of our drug candidates, including BIIB098 (dixromiel fumarate), which may be impacted by, among other things, unexpected concerns that may arise from additional data or analysis, the occurrence of adverse safety events, failure to obtain regulatory approvals in certain jurisdictions, failure to protect and enforce data, intellectual property, and other proprietary rights and uncertainties relating to intellectual property claims and challenges; actual timing and content of submissions to and decisions made by the regulatory authorities regarding BIIB098 (dixromiel fumarate); regulatory submissions may take longer or be more difficult to complete than expected; risks relating to the potential launch of VUMERITY (dixromiel fumarate), including preparedness of healthcare providers to treat patients, the ability to obtain and maintain adequate reimbursement for VUMERITY (dixromiel fumarate), and other unexpected difficulties or hurdles; product liability claims; and third party collaboration risks. The foregoing sets forth many, but not all, of the factors that could cause actual results to differ from our expectations in any forward-looking statement. Investors should consider this cautionary statement, as well as the risk factors identified in our most recent annual or quarterly report and in other reports we have filed with the U.S. Securities and Exchange Commission.

These statements are based on our current beliefs and expectations and speak only as of the date of this presentation. We do not undertake any obligation to publicly update any forward-looking statements, whether as a result of new information, future developments or otherwise.

Note regarding trademarks: AVONEX®, PLEGRIDY®, TECFIDERA®, TYSABRI®, and ZINBRYTA® are registered trademarks of Biogen. Other trademarks referenced in this presentation are the property of their respective owners.
<table>
<thead>
<tr>
<th>Section</th>
<th>Presenter</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Matt Calistri</td>
<td>VP, Investor Relations</td>
</tr>
<tr>
<td>Overview</td>
<td>Tracey Dawson, Ph.D.</td>
<td>VP, Product Development and Commercialization Lead for Multiple Sclerosis</td>
</tr>
<tr>
<td>Late Stage Programs</td>
<td>Aaron Deykin, M.D.</td>
<td>VP, Head of Multiple Sclerosis and Acute Neurology Late Stage Clinical Development Unit</td>
</tr>
<tr>
<td>Early Portfolio Overview</td>
<td>Nathalie Franchimont, M.D., Ph.D.</td>
<td>VP, Head of Multiple Sclerosis Research and Early Development Unit</td>
</tr>
<tr>
<td>Available for Q&amp;A</td>
<td>Michael Ehlers, M.D., Ph.D.</td>
<td>EVP, Research &amp; Development</td>
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</table>
Overview

Tracey Dawson, Ph.D.
VP, Product Development and Commercialization Lead for Multiple Sclerosis
Biogen’s Strategy in Multiple Sclerosis

1. Biogen is the global market leader in MS and our MS business has remained resilient.

2. We believe there are significant opportunities to address the remaining unmet needs of MS patients.

3. Advancing BIIB098 (diroximel fumarate) as a novel oral option with a potentially differentiated GI tolerability profile.

4. Opicinumab is a potential first-in-class remyelination agent to promote neuronal repair and potentially improve disability in MS.

5. Reinvesting in lifecycle management across our entire MS portfolio, including ongoing studies with TECFIDERA, investigation of extended interval dosing for TYSABRI, and development of an intramuscular (IM) formulation of PLEGRIDY.

6. Leveraging our established asymmetric expertise in MS and capabilities in neuroscience with the goal of developing an innovative pipeline of new molecules.
Multiple Sclerosis is a Large Global Market

~ 2.5 million prevalence, including progressive forms
~ 1 million treated patients worldwide, has been growing in mid single digits

~ 315k treated patients
~ 60k patients change therapy each year

~ 15k new to therapy each year

> $20 Billion Annual Global Market
Biogen is founded by a small group of visionary scientists.

1978

1996
Biogen launches AVONEX, an interferon treatment for relapsing MS.

2004
TYSABRI receives FDA approval.

2011
AVONEX Pen approved by the FDA.

2014
Biogen launches PLEGRIDY.

2016
FAMPYRA, Biogen’s symptomatic MS treatment, receives full EC approval.

2013
Biogen acquires full rights to TYSABRI from Elan.

2013
TECFIDERA launches and becomes the most prescribed oral MS therapy.

2017
Biogen initiates Phase 2b trial of opicinumab.

2017
Biogen acquires global rights for BIIB098 (diroxime fumarate) from Alkermes.

2018
Initiation of TYSABRI EID NOVA study and development of PLEGRIDY IM.

2018+
Biogen plans to continue to invest in new treatments for MS.

Deep History Developing Transformative Treatments for Multiple Sclerosis

2. Represents patients as of September 30, 2018.
Demonstrated Resilience in our $9 Billion MS Business

Biogen MS Patients
Thousands

2014: 306k
2015: 331k
2016: 343k
2017: 350k
Q3'18: 349k

HIGHLIGHTS

► Biogen products treat ~35% of all treated MS patients globally\(^1\)

► Focused on maintaining resilience in the face of new competition

Note: Patient numbers represent estimated ending patient count as of December 31\(^{st}\) of each year, except for 2018 which represents patients as of September 30, 2018.

2. ZINBRYTA was withdrawn from the market in March 2018.
Biogen’s Portfolio Covers the Treatment Spectrum in Relapsing MS

DMT-Treated Relapsing MS Patients

Newly Diagnosed Active

Newly Diagnosed More Active

Non-Efficacy Switch (safety, tolerability)

Efficacy Switch (active and more active)
Focused on Maximizing Patient Access

Broad U.S. Commercial Access

<table>
<thead>
<tr>
<th>Year</th>
<th>Unrestricted</th>
<th>Step Edit</th>
<th>Not Covered</th>
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<tbody>
<tr>
<td>2016</td>
<td>85%</td>
<td>14%</td>
<td>10%</td>
</tr>
<tr>
<td>2017</td>
<td>90%</td>
<td>15%</td>
<td>13%</td>
</tr>
<tr>
<td>2018</td>
<td>82%</td>
<td>14%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Pioneering U.S. Value-Based Contracts

- Working to tie pricing to clinical value while maximizing patient access
- 9 contracts ongoing covering ~ 80 million covered lives
  - Either aligning price to patient outcomes, or adjusting price for patients initiating therapy who discontinue
  - Initial insights have helped identify opportunities to potentially improve patient outcomes

“We want to provide open access to different MoAs given differential patient response. This helps us avoid downstream costs.” – National Payer
Investing in Lifecycle Management and New Data Generation

- Comparative efficacy analyses have shown that PLEGRIDY has potentially better clinical outcomes than REBIF, AUBAGIO, and COPAXONE\(^1\)-\(^3\)
- Recently generated data on the safety of interferons used during pregnancy
- Continued investment in IFN through efficacy and safety data generation and PLEGRIDY IM

- Recent comparative effectiveness data showed TECFIDERA has relative improvement in real-world effectiveness versus interferon, COPAXONE, and AUBAGIO, and similar effectiveness versus GILENYA\(^4\)
- Continued investment in data generation - novel endpoints and real-world data
- Ongoing ENDORSE study to generate long-term safety and efficacy data

- Advances in anti-JCV antibody index as well as MRI monitoring have helped physicians monitor for PML
- Continuing to generate long-term data from the TYSABRI Observational Program (TOP) to reinforce the effectiveness of TYSABRI
- Initiated the Phase 3b NOVA study evaluating the efficacy of extended interval dosing of TYSABRI

- New oral fumarate investigational drug
- Potential for improved GI tolerability vs. TECFIDERA
- Head to head study vs. TECFIDERA ongoing with data expected in mid-2019, U.S. filing expected very soon
- Additional lifecycle investments being made to support differentiation
- Plans to file outside the U.S. under consideration as well as exploratory work on new indications

Note: The brand name VUMERITY has been conditionally accepted by the FDA and will be confirmed upon approval.
3. Scott, T. Presented at Congress of the European Committee for Treatment & Research in Multiple Sclerosis 2018. Biogen co-authored this research.
Comparative Effectiveness Data Reinforce Efficacy Profile of TECFIDERA

- Recent data from the German Neurotransdata MS registry demonstrated relative improvement in real-world effectiveness for TECFIDERA (DMF) versus interferon-β (IFN), glatiramer acetate (GA), and teriflunomide (TER)

- Similar effectiveness was observed between DMF and fingolimod (FTY)


TTFR = time to first relapse
Long-term Rates of Brain Atrophy Remain Low with TECFIDERA

• In the ENDORSE study (baseline to year 5), yearly percentage brain volume change (PBVC) for patients treated with TECFIDERA was within the range of that expected in healthy individuals (based on an estimated 0.1–0.3% change per year).

10-Year Data Support Strong Efficacy of TYSABRI

Real-world data from over 10 years in the TYSABRI (natalizumab) Observational Program

Collaboration with 10 leading MS centers to collect longitudinal clinical, MRI, and biologic data from patients in real time, at the point of care. Over 14,000 patients enrolled to-date.

iPad-based assessment to monitor motor, visual, and cognitive function.

Data has the potential to help identify or validate biomarkers and MRI metrics, enable precision medicine, and generate real-world evidence for disease modifying therapies.

Free iPad-based assessment tool designed to evaluate cognitive function in MS patients.

Developing a serum NfL blood test with the aim of providing a highly sensitive, robust, and validated assay to better understand disease activity and monitor treatment response.
Advancing Biomarkers to Monitor Disease Progression

In RRMS, elevated levels of serum neurofilament light (sNFL) at baseline were associated with:

- Greater Gd+ lesion count at baseline\(^a\)
- Increased T2 lesion volume over 5 years\(^b\)
- Increased brain atrophy over 5 years\(^b\)
- Worsened clinical disability over 5 years\(^c\)

TYSABRI treatment is associated with reduced sNFL levels\(^d\)

Continued natalizumab, all with no Gd+ lesions (n=45)
Discontinued natalizumab, developed Gd+ lesions (n=65)

\(^a\) Combined data from ADVANCE, CHAMPS, and SENTINEL studies.
\(^b\) Data from CHAMPS/CHAMPIONS studies.
\(^c\) Data from CHAMPS.
\(^d\) Fox RJ et al. Temporal Relationship of Serum Neurofilament Light (NfL) Levels and Radiological Disease Activity in MS Patients. Presented at Congress of the European Committee for Treatment & Research in Multiple Sclerosis 2018. P532.

RRMS = relapsing-remitting multiple sclerosis
### Future Opportunities Across Spectrum of the Disease

<table>
<thead>
<tr>
<th></th>
<th>RRMS</th>
<th>Relapsing SPMS</th>
<th>Non-Relapsing SPMS</th>
<th>PPMS</th>
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<tbody>
<tr>
<td>Treatment Rate</td>
<td>70-80%</td>
<td>30-50%</td>
<td>30-50%</td>
<td>30-50%</td>
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<tr>
<td>2.5 MM Prevalent Patients Worldwide</td>
<td>60%</td>
<td>15%</td>
<td>15%</td>
<td>10%</td>
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<tr>
<td>1.6 MM Prevalent Patients in U.S. &amp; EU</td>
<td>70-75%</td>
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**RRMS** = relapsing remitting multiple sclerosis  
**SPMS** = secondary progressive multiple sclerosis  
**PPMS** = primary progressive multiple sclerosis
Pursuing Potential Transformative Investigational Therapies

Our Mission
Be the most valued leader in MS by transforming the care of people living with MS

Modify course of disease with transformative therapies for relapsing MS
- Pursue next generation therapies in relapsing MS
- Advance lifecycle management for current portfolio

Advance the care in progressive MS
- Grow pipeline with targets leveraging emerging insights / advances in progressive MS biology

Slow or reverse disability and restore function
- Develop novel therapies that can reverse or halt disability progression through CNS repair or remyelination
- Develop capabilities to support innovative approaches for remyelination and axonal protection / repair
Investing in Lifecycle Management and R&D

<table>
<thead>
<tr>
<th>Strategic Area</th>
<th>Preclinical</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>LCM</th>
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</thead>
<tbody>
<tr>
<td><strong>Transformative Relapsing MS</strong></td>
<td>VUMERITY™ (diroximel fumarate)*</td>
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<td>Lymphocyte trafficking agent</td>
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<td>Additional mechanisms</td>
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<tr>
<td><strong>Progressive MS</strong></td>
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<tr>
<td>Additional mechanisms</td>
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<tr>
<td><strong>Improve Disability &amp; Restore Function</strong></td>
<td>Opicinumab (anti-LINGO)</td>
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<tr>
<td>BIIB061</td>
<td></td>
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<tr>
<td>Additional mechanisms</td>
<td></td>
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<tr>
<td><strong>Life-Cycle Management</strong></td>
<td>PLEGRIDY IM</td>
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<td>TYSABRI EID</td>
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<td>IFN PREGNANCY</td>
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*In collaboration with Alkermes.
Late Stage Programs

Aaron Deykin, M.D.
VP, Head of Multiple Sclerosis and Acute Neurology Late Stage Clinical Development Unit
Diroximel Fumarate Is a Potential Novel Oral Option

THE MOLECULE
• Rapidly converts to monomethylfumarate (MMF) and (inactive) leaving group
• May offer differentiated GI profile versus TECFIDERA (DMF) and potential to expand oral market

DEVELOPMENT PATH
Plan to file via 505 b(2) pathway very soon:
• Pharmacokinetic bridging to TECFIDERA
• Study 301: Single-arm two-year safety study of RRMS patients. June 2018 data cut to support filing.

Study 302: Head-to-head comparison of DRF vs TECFIDERA on GI symptoms. Data expected mid-2019.
Efficacy of DRF Appears Comparable to TECFIDERA

- Interim data from EVOLVE-MS-1 (N=617) as of January 12, 2018 demonstrated no unexpected safety findings based on the known safety profile of TECFIDERA
- GI adverse events (AEs) leading to discontinuation were below 1%
- GI AEs occurred in 28.5% of patients overall (up to 24 months)

Leigh-Pemberton, R. MRI and Relapse Results for ALKS 8700 in RRMS: 1-year Interim Results from the Phase 3 EVOLVE-MS-1 Study. Presented at the American Academy of Neurology Annual Meeting 2018. 006.
*N=374 as of January 12, 2018
DRF May Potentially Offer a Differentiated GI Tolerability Profile vs. TECFIDERA

HYPOTHESIS
DRF may elicit less localized irritation

• Possibly due to less irritant leaving group

The clinical implications of the distinct chemical features of DRF are being evaluated in the ongoing head-to-head study with TECFIDERA
Opicinumab: Investigating Remyelination to Potentially Reverse Disability

Fully human anti-LINGO-1 monoclonal antibody

THERAPEUTIC HYPOTHESIS:

• LINGO-1 is a negative regulator of oligodendrocyte precursor cell differentiation
• Blocking LINGO-1 with opicinumab may enhance remyelination

Lymphocyte-driven Inflammation
Demyelination

Axonal loss and neurodegeneration
Axon maintenance and neuronal viability

Opicinumab has potential to be first therapy to promote CNS repair in MS
Novel Patient Selection Criteria and Endpoints for Opicinumab

SYNERGY
• Multimodal MRI analysis identified lesions characterized by reduced myelin content but preserved axon integrity
• This analysis may identify a patient population amenable to remyelination-mediated repair

AFFINITY
• Leverages learnings from SYNERGY to inform patient selection and dose
• Enrollment completed ~7 months ahead of schedule; data expected mid-2020

Clinical Efficacy for Identified Subpopulation

N = 25 (placebo)  
N = 21 (10 mg/kg)
Furthering Understanding of PML Risk for TYSABRI

- **2010–11**: Prior immunosuppressant & treatment duration
- **2011–12**: Presence of anti-JCV antibodies
- **2013–16**: Anti-JCV antibodies index values
- **2014–16**: Guidelines on frequency of MRI monitoring
- **2018**: Exploring potential of Extended Interval Dosing (EID)
To determine whether EID is associated with lower PML risk compared with SID in TOUCH

EID = extended interval dosing; SID = standard interval dosing; REMS = Risk Evaluation and Mitigation Strategy.

• Restricted program under a REMS, focused on safety and developed with the help of U.S. regulators
• All prescribers, infusion sites, and patients receiving TYSABRI are required to enroll

• Largest data source that could inform on PML risk in patients on EID (90,038 patients as of June 1, 2017)
• Accurate capture of the 3 risk factors for PML (anti-JCV antibody status, prior immunosuppressant use, exposure)

Analysis Objective

To determine whether EID is associated with lower PML risk compared with SID in TOUCH
The analysis populations include anti-JCV antibody positive patients without a treatment gap (>12 weeks between doses) or overdosing (<3 weeks between doses). Data shown are for the primary analysis in which EID was defined as ≤ 15 infusions in the last 18 months and SID was defined as > 15 infusions in the last 18 months. Additional analyses examined secondary and tertiary definitions of EID. aEID vs SID. Model includes age, sex, prior use of immunosuppressants, EID/SID group, and calendar year at the start of natalizumab treatment as covariates; HR=hazard ratio. Zhovtis Ryerson L et al. Presented at Congress of the Americas Committee for the Treatment & Research in Multiple Sclerosis 2018. LB350.

EID was Associated with Significantly Lower PML Risk versus SID

US TOUCH Registry Analysis

95% confidence intervals indicate a 78%-99% reduction in PML risk

P value from log-rank test: <0.001
Hazard Ratio (HR) (95% CI) from Cox regression analysis*: 0.06 (0.01–0.22); P<0.001

PML: Pegasys-directed lymphocytic infiltration of the brain; EID: every intended dose; SID: standard interval dosing; TYSABRI: natalizumab; Biogen: manufacturer of TYSABRI.
**Phase 3b NOVA Study to Assess Efficacy of TYSABRI EID**

**Study Objective**

To evaluate the efficacy, safety, and tolerability of 6-week TYSABRI dosing intervals in patients with RRMS who switch to EID after one year of treatment with standard TYSABRI dosing in relation to continued SID treatment.

**Primary Endpoint**

Dosing intervals assessed in the NOVA study encompass the EID practice associated with the lower risk of PML in the TOUCH analysis.²

The primary objective is to estimate differences in new or newly enlarging T2 lesions between the SID and EID regimens at 48 weeks.

*Follow up end of study visit at 84 weeks and safety phone call at 96 weeks

Intramuscular PLEGRIDY May Provide Improved Tolerance Profile

BACKGROUND

- Tolerability (~50% split between injection site reactions (ISRs) and flu-like symptoms) has been the leading cause of discontinuations from PLEGRIDY (subcutaneous) in the first 3 years after launch.
- AVONEX IM vs. subcutaneous interferon demonstrated fewer ISRs\(^1\).
- Hypothesis: Reducing ISRs with PLEGRIDY IM decreases discontinuation rates.

DEVELOPMENT PATH EMBRACES SPEED TO MARKET

- **Goal:** Demonstrate reduction in ISRs with PLEGRIDY IM to levels comparable to AVONEX IM while maintaining PLEGRIDY efficacy and convenience of twice monthly dosing.
- **Recent milestone:** In December 2018, the first patient was dosed in bioequivalence study.

<table>
<thead>
<tr>
<th>Year</th>
<th>Administration preference</th>
<th>Safety</th>
<th>Tolerability</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>18%</td>
<td>43%</td>
<td>36%</td>
<td>4%</td>
</tr>
<tr>
<td>2016</td>
<td>29%</td>
<td>47%</td>
<td>7%</td>
<td>4%</td>
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<td>2017</td>
<td>41%</td>
<td>42%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>2018</td>
<td>45%</td>
<td>36%</td>
<td>3%</td>
<td>3%</td>
</tr>
</tbody>
</table>

2. Based on market research in each given year, not full year data; Biogen data on file (U.S. + EU5 + Canada).
Early Portfolio Overview

Nathalie Franchimont, M.D., Ph.D.
VP, Head of Multiple Sclerosis Research and Early Development Unit
Relapsing MS DMTs need **more favorable benefit-risk profiles and lower patient burden**

Few DMTs have proven to be effective in **progressive MS**

Current MS treatments cannot **fully halt or reverse disease progression**
No Longer a Binary View of MS

Relapsing MS

Progressive MS

INFLAMMATION

NEURODEGENERATION

Shift in disease paradigms...
### SCIENTIFIC OBJECTIVE

<table>
<thead>
<tr>
<th>DEVELOP TRANSFORMATIVE THERAPIES FOR RELAPSING MS</th>
<th>ADVANCE CARE IN PROGRESSIVE DISEASE</th>
<th>IMPROVE DISABILITY AND RESTORE FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Target validated pathways with promise of added efficacy as compared to B-cell depletion alone</td>
<td>• Target CNS-resident immune cells, a key driver of cortical demyelination in PMS</td>
<td>• Enhance the intrinsic remyelination capability of oligodendrocyte precursor cells (OPCs)</td>
</tr>
<tr>
<td>• Blockade of inflammation similar to TYSABRI/OCREVUS</td>
<td>• Engineering new molecules with the potential for enhanced brain penetration</td>
<td>• Understand and release the molecular brake on endogenous remyelination mechanisms</td>
</tr>
<tr>
<td>• MoAs that offer add-on mechanisms to B cell inhibition (e.g. T cells; myeloid cells)</td>
<td></td>
<td>• Protect or restore the functional integrity of axons that have been damaged in the course of chronic disease</td>
</tr>
</tbody>
</table>

We will continue to assess and maximize our access to new modalities and capabilities and explore emerging biology with the goal of bringing innovative medicines to patients.
Addressing the Remaining Unmet Needs of Relapsing MS Patients

Current pipeline:

**VUMERITY (DRF)**
(Phase 3)
- Novel oral option with potential for differentiated GI tolerability vs. TECFIDERA
- Plan to file in U.S. very soon

**New Lymphocyte Trafficking Agent**
(Pre-IND)
- Aiming for TYSABRI-like efficacy or increased potency
- Potential for IV or subcutaneous formulation

**Additional Mechanisms**
(Preclinical & Clinical Assets)
- Targeting clinically validated targets such as B-cell in addition to other cells (e.g. myeloid cells, T cells)
- Aiming for high efficacy with a differentiated safety profile
Targeting CNS-Compartmentalized Inflammation for Progressive Disease

- Disease progression
  - Cortical demyelination
  - Cytotoxic inflammatory mediators
  - Meningeal / parenchymal infiltrates

- Brain parenchyma
  - Perivascular, parenchymal infiltrates
  - CNS-Imm.

- Cortical demyelination

- Meninges [Subarachnoid space]
  - Meningeal infiltrates
  - CNS-Imm.

- CSF
  - Ig synthesis
  - Oligoclonal bands

- Blood
  - B cells
  - T cells
  - Macrophages
  - Microglia

CNS-Imm. = CNS-penetrant immunomodulator
## Working to Improve Disability and Restore Function

### Current pipeline:

<table>
<thead>
<tr>
<th><strong>Opicinumab</strong></th>
<th>• Potential <strong>first-in-class</strong> therapy for CNS repair in MS through remyelination, resulting in improvement in disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>anti-LINGO-1 (Phase 2b)</td>
<td>• Ongoing Phase 2b (AFFINITY) study: <strong>Data expected mid-2020</strong></td>
</tr>
<tr>
<td><strong>BIIB061</strong></td>
<td>• Small molecule designed to promote differentiation of oligodendrocyte progenitors and enhance remyelination</td>
</tr>
<tr>
<td>(Phase 2 Ready)</td>
<td>• Planning to initiate <strong>Phase 2 study in 2019</strong></td>
</tr>
<tr>
<td><strong>Additional mechanisms</strong></td>
<td>• Leveraging internal expertise and external collaboration to nominate and validate new targets</td>
</tr>
<tr>
<td>(Preclinical)</td>
<td>• Exploring multiple approaches and multiple modalities</td>
</tr>
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*Small molecule*  
*Monoclonal antibody*
Building Core Capabilities to Increase Probability of Success

- Better understanding of CNS inflammation, pathology and imaging
- Remyelination and repair platform (in vitro and in vivo)
- Advanced MS animal models that are closer to PMS
- Large Biobanks and Epidemiology resources
- Monitoring tools to increase cognition decline diagnosis rates and accelerate therapy development
- Multimodal neuroimaging to inform patient selection
- Leverage new modalities and capabilities
  - Explore emerging biology to bring innovative medicines to patients
  - PK/PD modeling platforms
- Leverage expertise to accelerate clinical development
- Novel MS clinical endpoints
- Pre and post market Real-World Evidence
- In vivo imaging and fluid biomarkers
- Markers of meningeal inflammation and damage
- Remyelination and synaptic density imaging biomarkers
- Agreement with UK Biobank to enable deeper genetic insights
- Genetics & disease progression analysis
  - iPSC Technologies and 3D Human Tissue Models
  - Genome-wide CRISPR screening

Greater understanding of disease biology
Greater patient stratification by disease pathology
Improved modalities
Advances in genetics
Regulators’ openness to new ideas
New tech-enabled biomarkers

NEUROSCIENCE LEADER

DATA, ANALYTICS, AND TECHNOLOGY
Leveraging our Depth in MS to Expand Neuroscience Leadership
Questions & Answers