Extending Our Leadership Position in Multiple Sclerosis

December 12, 2018

Biogen

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 (diroximel fumarate), opicinumab, extended interval dosing (EID) TYSABRI, an intermuscular formulation of PLEDGRIDY, 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 (diroximel 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 (diroximel fumarate), opicinumab, EID TYSABRI, an intermuscular formulation of PLEDGRIDY, 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 (diroximel 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 (diroximel fumarate); regulatory submissions may take longer or be more difficult to complete than expected; risks relating to the potential launch of VUMERITY (diroximel fumarate), including preparedness of healthcare providers to treat patients, the ability to obtain and maintain adequate reimbursement for VUMERITY (diroximel 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.

MS R&D Webcast Call Agenda

Introduction	**Matt Calistri** VP, Investor Relations
Overview	**Tracey Dawson, Ph.D.** VP, Product Development and Commercialization Lead for Multiple Sclerosis
Late Stage Programs	**Aaron Deykin, M.D.** VP, Head of Multiple Sclerosis and Acute Neurology Late Stage Clinical Development Unit
Early Portfolio Overview	**Nathalie Franchimont, M.D., Ph.D.** VP, Head of Multiple Sclerosis Research and Early Development Unit
Available for Q&A	**Michael Ehlers, M.D., Ph.D.** EVP, Research & Development

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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

> $20 Billion Annual Global Market

~ 2.5 million prevalence, including progressive forms

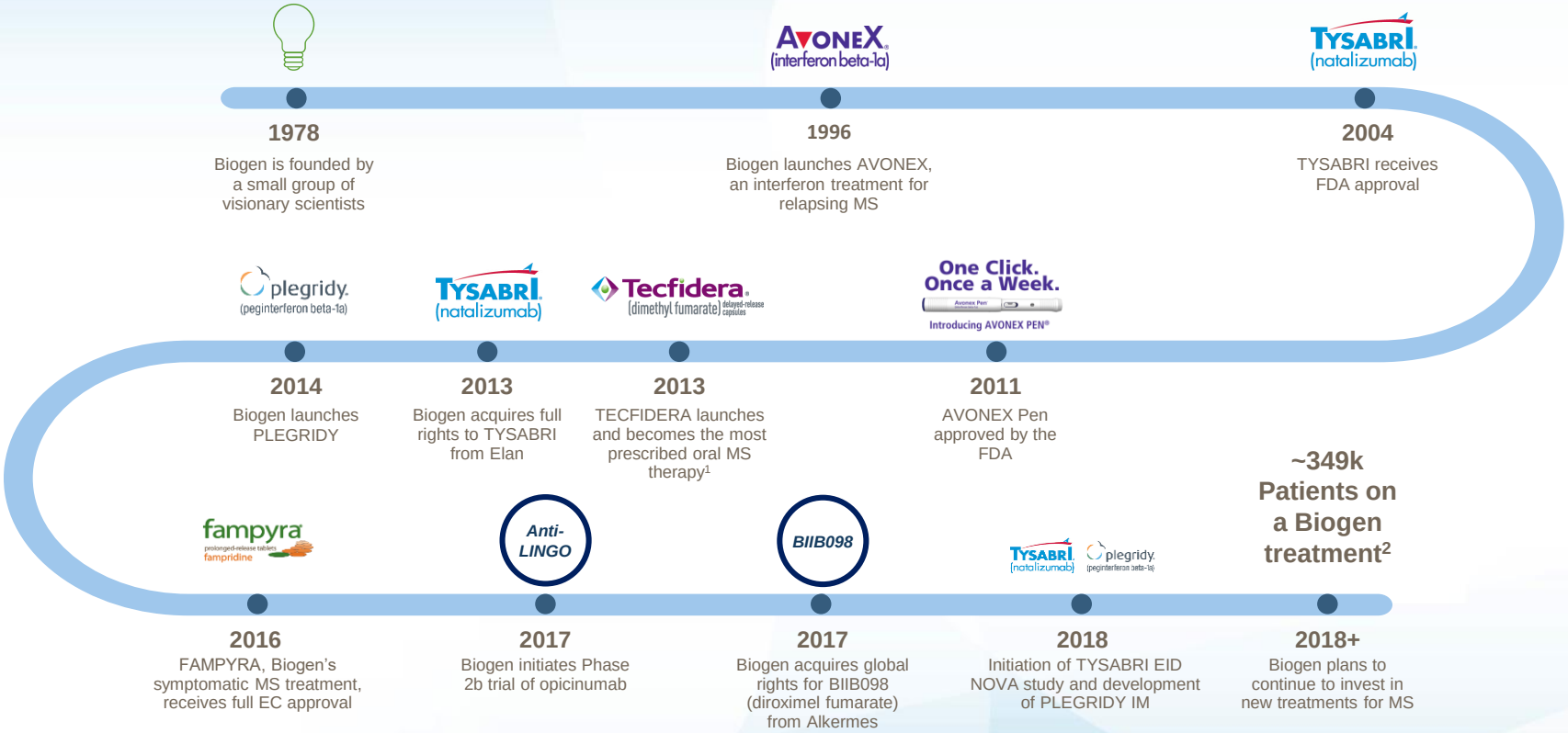
~ 1 million treated patients worldwide, has been growing in mid single digits

~ 15k new to therapy each year

~ 315k treated patients

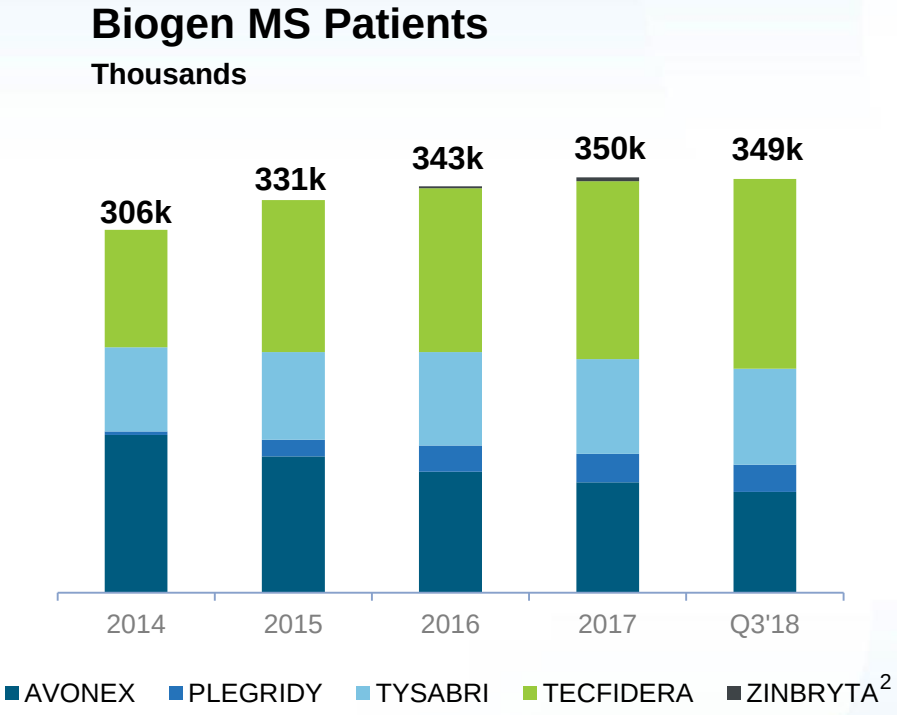
~ 60k patients change therapy each year

Deep History Developing Transformative Treatments for Multiple Sclerosis



1. Biogen data on file.
2. Represents patients as of September 30, 2018.

Demonstrated Resilience in our $9 Billion MS Business



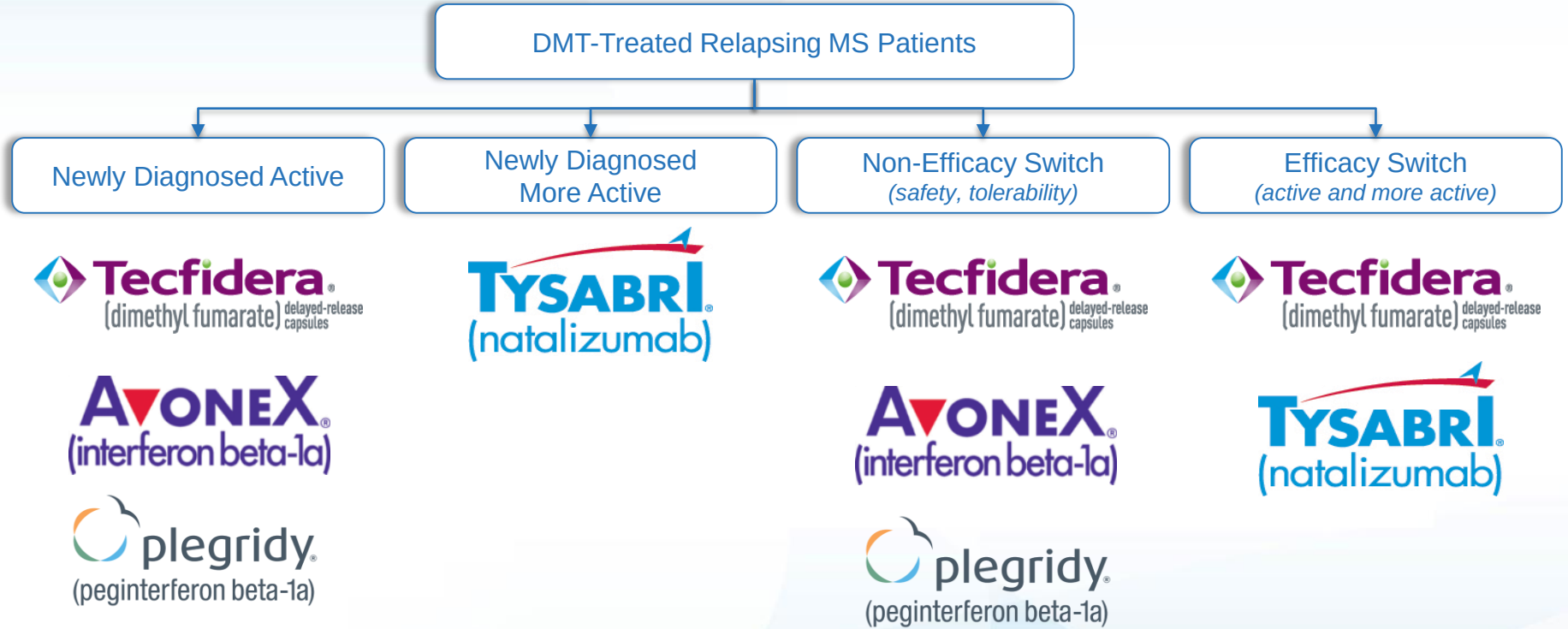
HIGHLIGHTS

- 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 31st of each year, except for 2018 which represents patients as of September 30, 2018.

1. Biogen data on file 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



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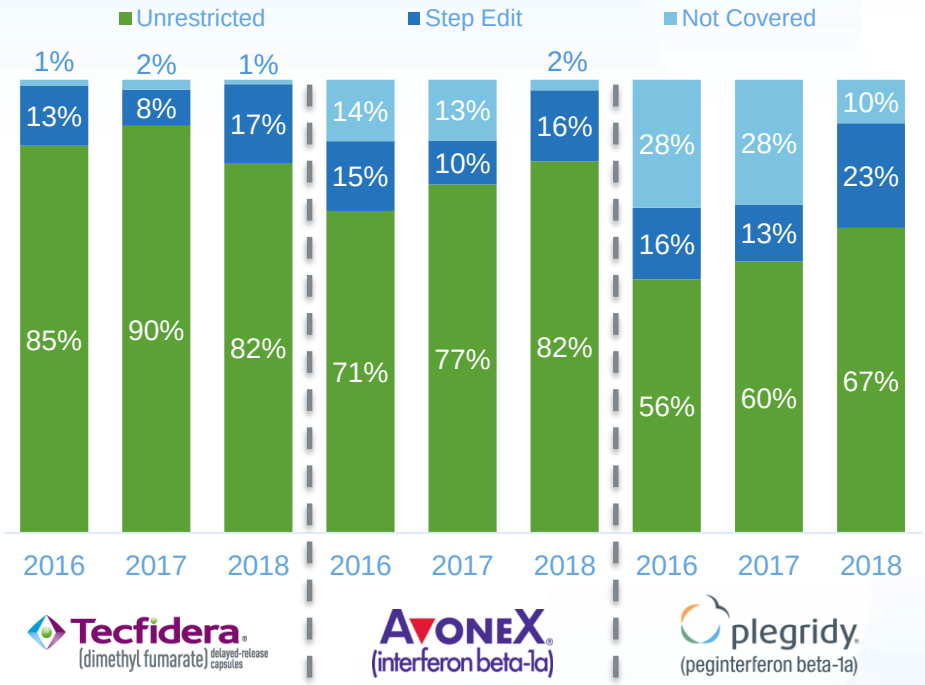
Focused on Maximizing Patient Access

Broad U.S. Commercial Access



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

AVONEX (interferon beta-1a) / plegridy (peginterferon beta-1a)

- 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

Tecfidera (dimethyl fumarate) delayed-release capsules

- 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

TYSABRI (natalizumab)

- 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

VUMERITY™ (diroximel fumarate)

- 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.

1. Newsome SD et al. Presented at American Academy of Neurology 2018 Annual Meeting; Poster 360. Biogen co-authored this research.
2. Coyle PK et al. *Mult Scler Rel Disord*. 2018. Biogen co-authored this research.
3. Scott, T. Presented at Congress of the European Committee for Treatment & Research in Multiple Sclerosis 2018. Biogen co-authored this research.
4. Braune S et al. Comparative effectiveness of delayed-release dimethyl fumarate versus interferon, glatiramer acetate, teriflunomide, or fingolimod: results from the German NeuroTransData registry. *J Neurol.* 2018. Biogen co-authored this research.

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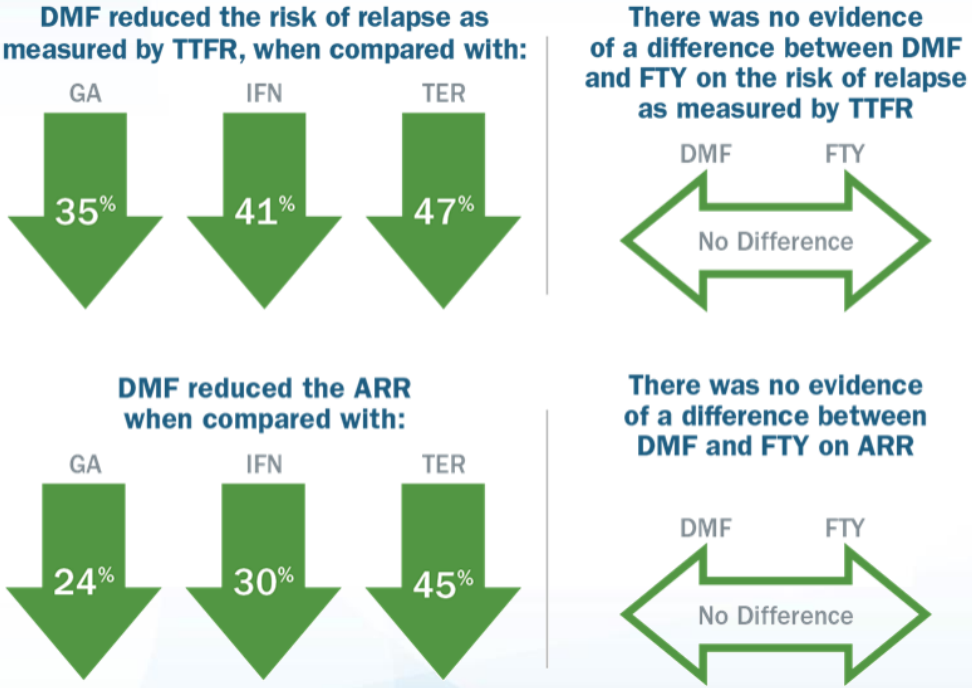
Comparative Effectiveness Data Reinforce Efficacy Profile of TECFIDERA

- 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)

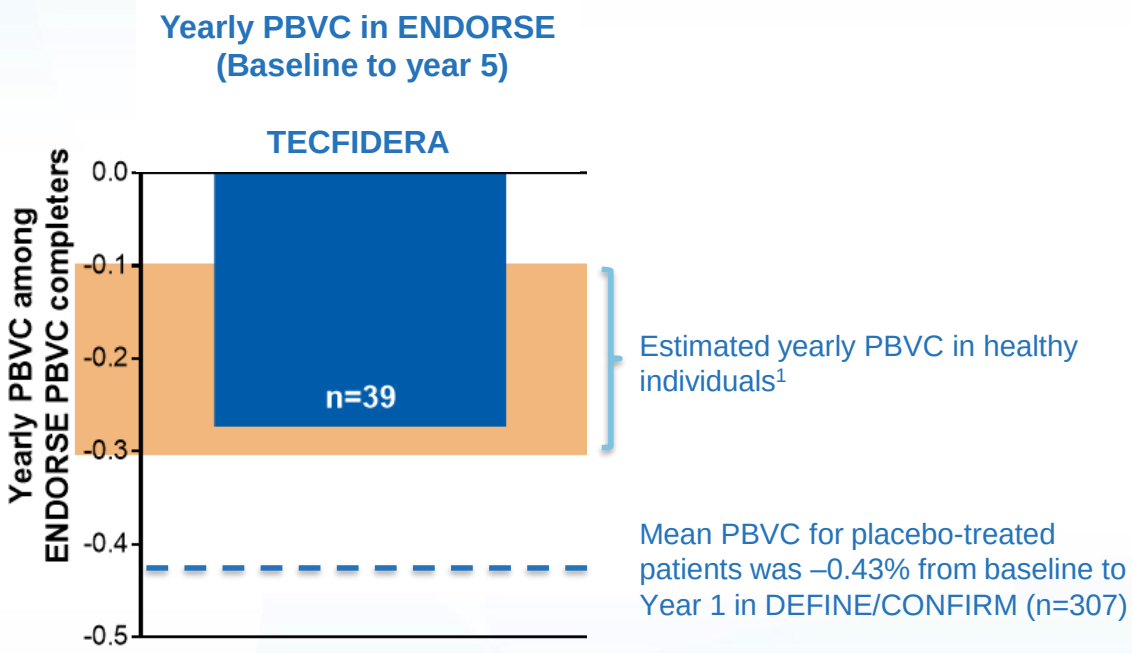


Braune S et al. Comparative effectiveness of delayed-release dimethyl fumarate versus interferon, glatiramer acetate, teriflunomide, or fingolimod: results from the German NeuroTransData registry. *J Neurol*. 2018. Biogen co-authored this research.

TTFR = time to first relapse

Long-term Rates of Brain Atrophy Remain Low with TECFIDERA

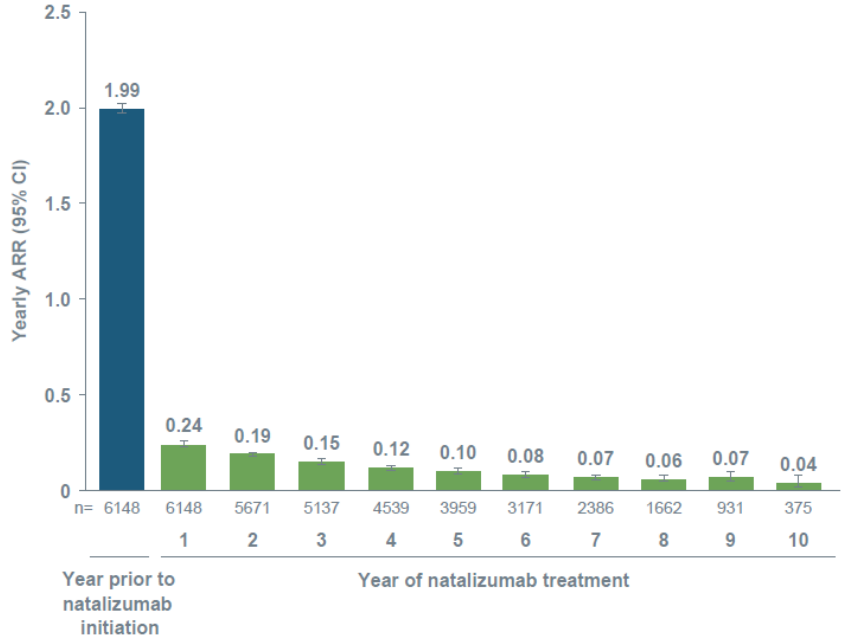
- In the ENDORSE study (baseline to year 5), yearly percentage brain volume change (PBVC) for patients treated with TECFIDERA was within the range of that expected in healthy individuals (based on an estimated 0.1–0.3% change per year)

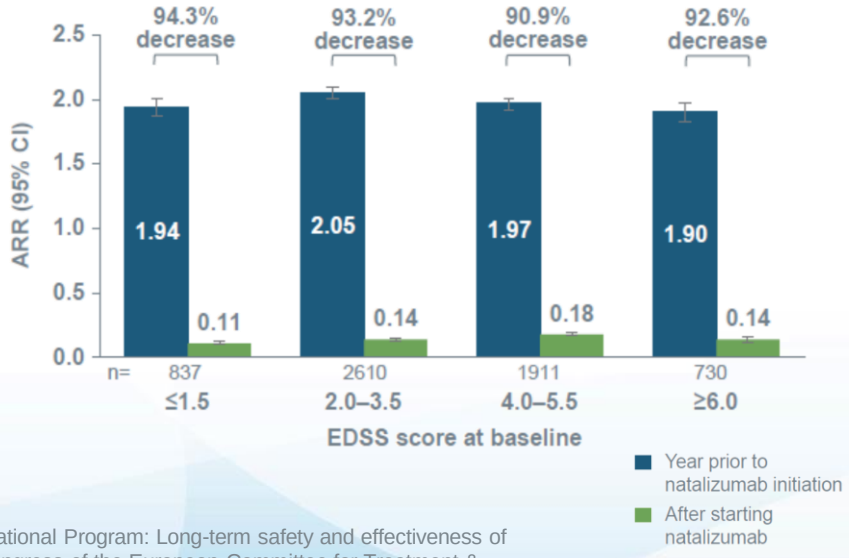


1. Miller DH et al. Measurement of atrophy in multiple sclerosis: pathological basis, methodological aspects and clinical relevance. *Brain*. 2002.

10-Year Data Support Strong Efficacy of TYSABRI

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





Kappos L et al. Real-world data from over 10 years in the TYSABRI® Observational Program: Long-term safety and effectiveness of natalizumab in relapsing-remitting multiple sclerosis patients. Presented at Congress of the European Committee for Treatment & Research in Multiple Sclerosis 2018. P908.

Advancing the Standard of Care beyond Disease-Modifying Therapies

MS PATHS
Partners Advancing Technology and Health Solutions

- 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

SIEMENS Healthineers

- 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

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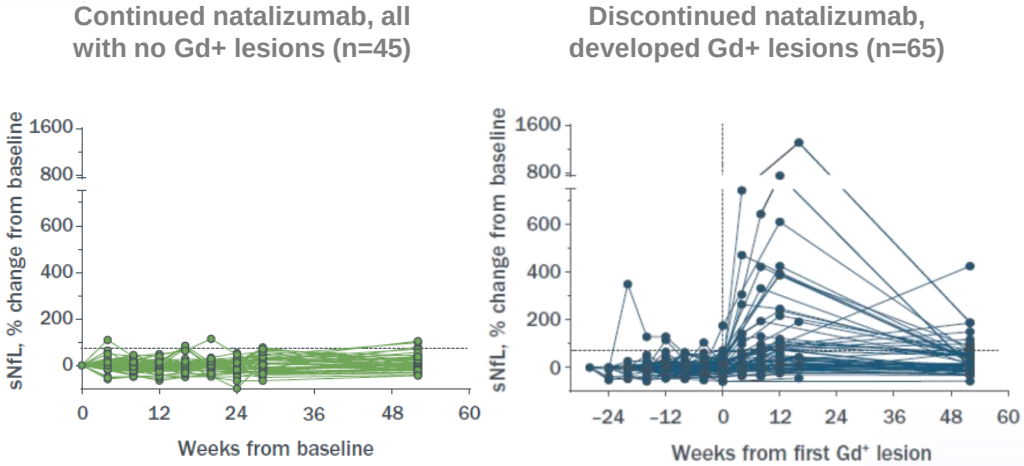
Advancing Biomarkers to Monitor Disease Progression

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]



[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

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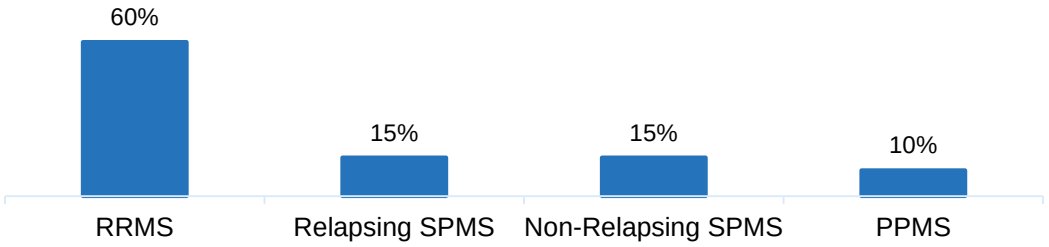
Future Opportunities Across Spectrum of the Disease

2.5 MM Prevalent Patients Worldwide

1.6 MM Prevalent Patients in U.S. & EU

70-75% Diagnosed



Treatment Rate	70-80%	30-50%	30-50%	30-50%

RRMS = relapsing remitting multiple sclerosis
SPMS = secondary progressive multiple sclerosis
PPMS = primary progressive multiple sclerosis

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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

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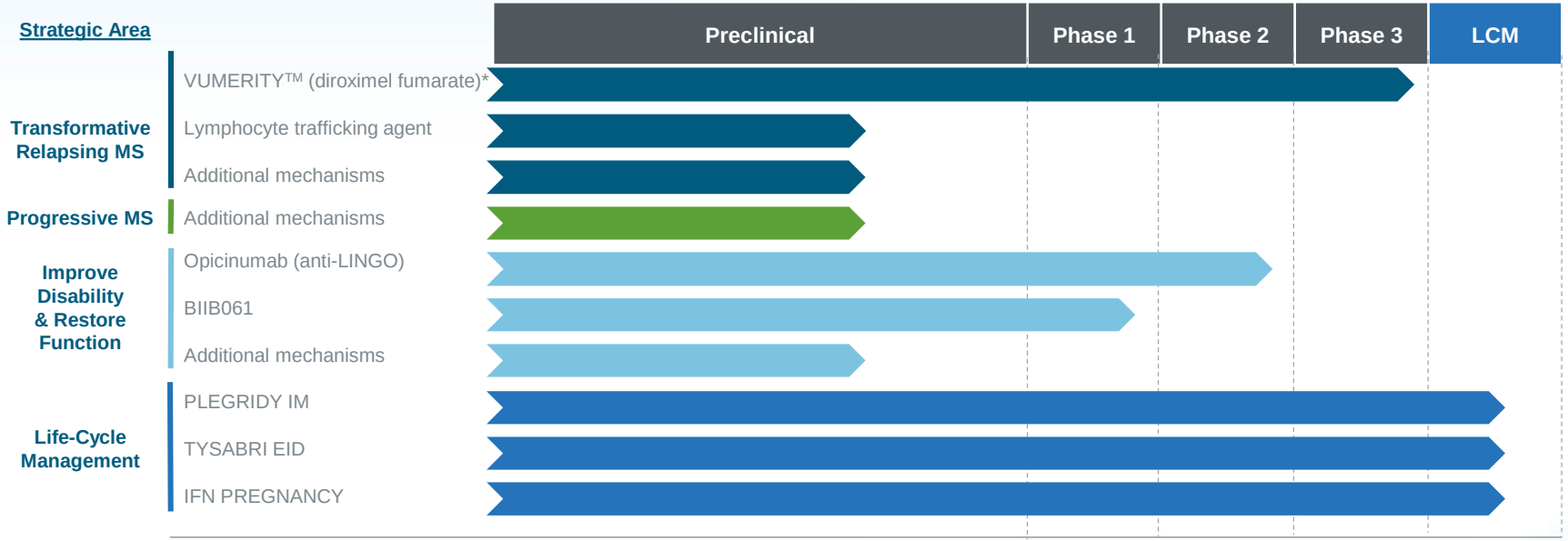
Investing in Lifecycle Management and R&D



*In collaboration with Alkermes.

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Late Stage Programs

Aaron Deykin, M.D.

VP, Head of Multiple Sclerosis and Acute Neurology Late Stage Clinical Development Unit

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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

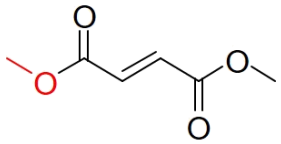
DEVELOPMENT PATH

Plan to file via 505 b(2) pathway very soon:

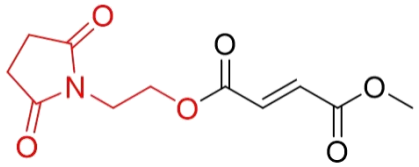
- Pharmacokinetic bridging to TECFIDERA
- Study 301: Single-arm two-year safety study of RRMS patients. June 2018 data cut to support filing.

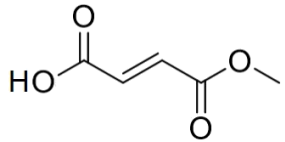
Study 302: Head-to-head comparison of DRF vs TECFIDERA on GI symptoms. Data expected mid-2019.

DMF
Dimethyl Fumarate



DRF
Diroximel Fumarate

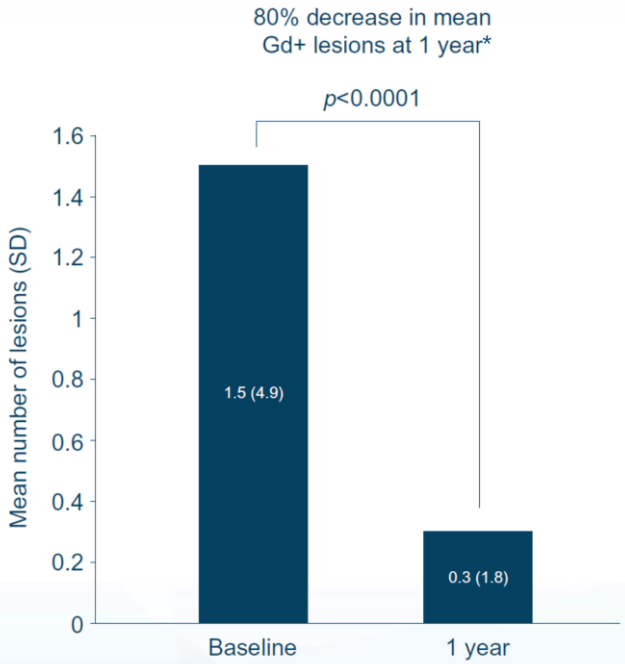




MMF
Monomethyl Fumarate

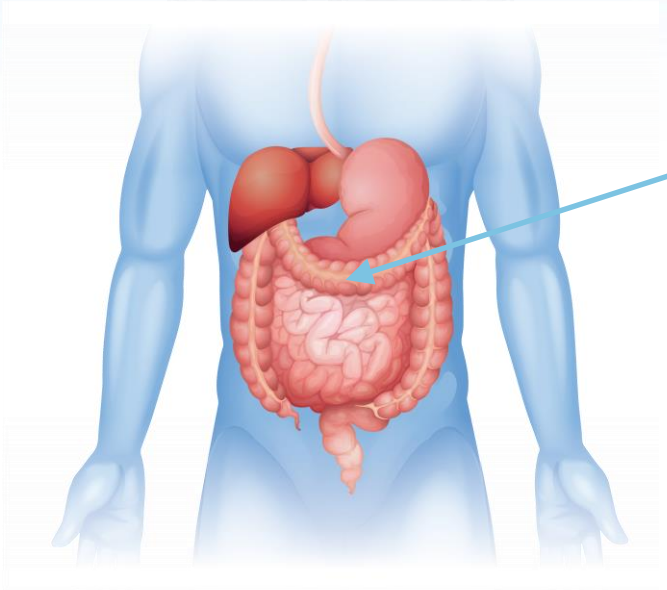
Efficacy of DRF Appears Comparable to TECFIDERA

- 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

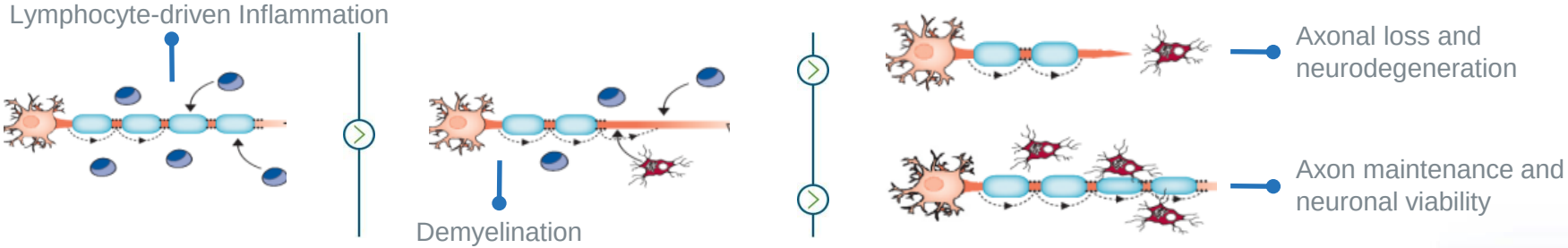
The clinical implications of the distinct chemical features of DRF are being evaluated in the ongoing head-to-head study with TECFIDERA

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

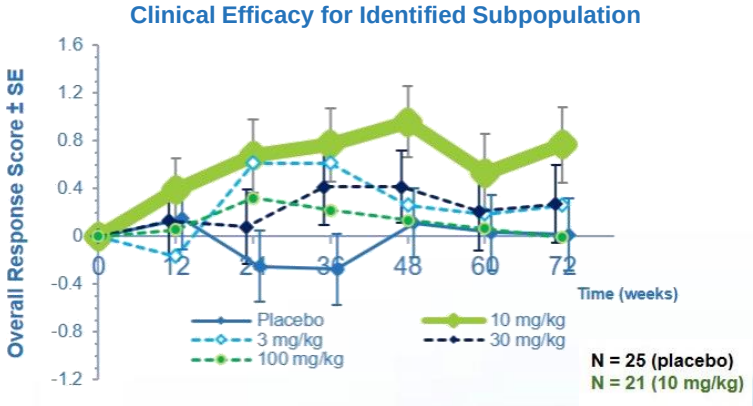


Opicinumab has potential to be first therapy to promote CNS repair in MS

Novel Patient Selection Criteria and Endpoints for Opicinumab

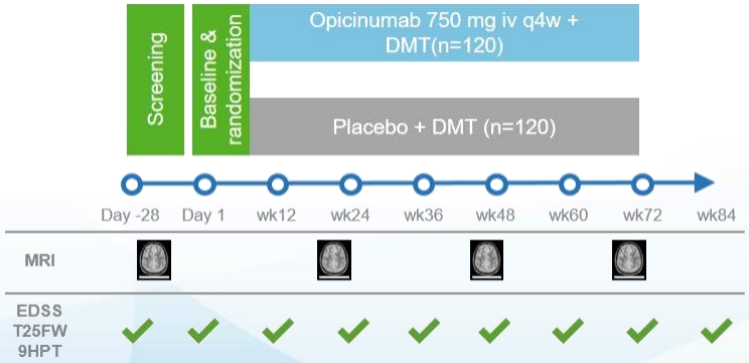
SYNERGY

- 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



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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)

JCV=John Cunningham virus.

Real-World Data to Assess PML Risk with TYSABRI EID

TOUCH™ PRESCRIBING PROGRAM

TYSABRI Outreach: Unified Commitment to Health

- **Restricted program under a REMS, focused on safety and developed with the help of U.S. regulators[1]**
- **All prescribers, infusion sites, and patients receiving TYSABRI are required to enroll[1]**

- **Largest data source that could inform on PML risk in patients on EID (90,038 patients as of June 1, 2017)[2]**
- Accurate capture of the 3 risk factors for PML (anti-JCV antibody status, prior immunosuppressant use, exposure)

Analysis Objective[2]

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.

1. Panzara M et al. Presented at Congress of the European Committee for Treatment & Research in Multiple Sclerosis 2009. P458. 2. Zhovtis Ryerson L et al. Presented at Congress of the Americas Committee for the Treatment & Research in Multiple Sclerosis 2018. LB350.

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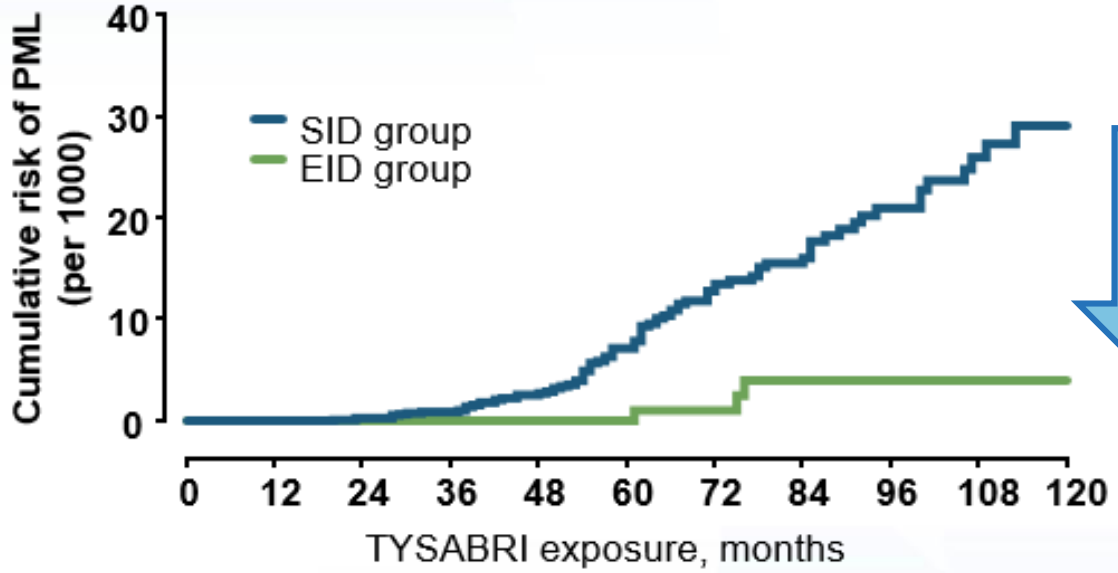
EID was Associated with Significantly Lower PML Risk versus SID

US TOUCH Registry Analysis



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

P value from log-rank test: <0.001

HR (95% CI) from Cox regression analysis[a]: 0.06 (0.01–0.22); *P*<0.001

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. [a]EID 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.

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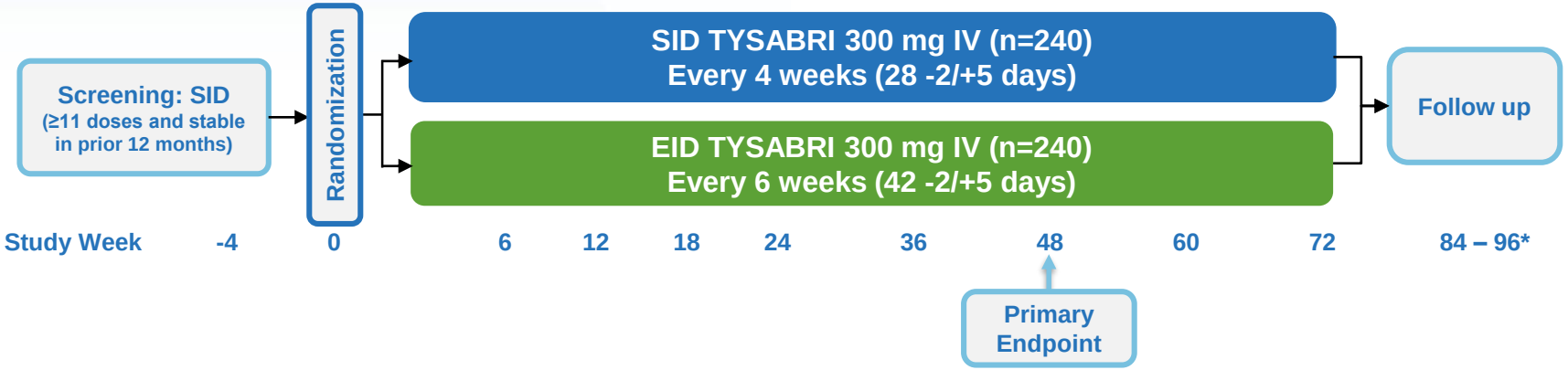
Phase 3b NOVA Study to Assess Efficacy of TYSABRI EID

Study Objective[1]

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



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

1. https://clinicaltrials.gov/ct2/show/NCT03689972
2. Zhovtis Ryerson L et al. Presented at Congress of the Americas Committee for the Treatment & Research in Multiple Sclerosis 2018. LB350.

Intramuscular PLEGRIDY May Provide Improved Tolerability Profile

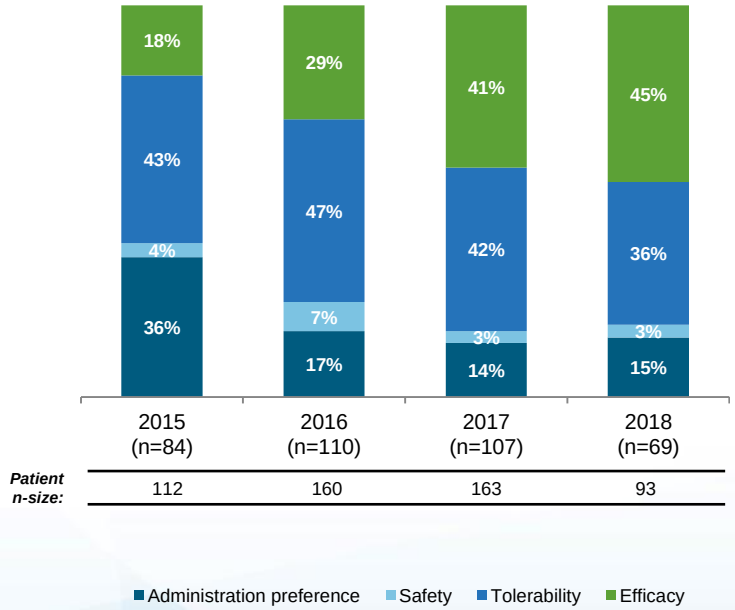
BACKGROUND

- 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 first patient was dosed in bioequivalence study

PLEGRIDY SWITCH OUTS BY REASON[2]



1. Balak D et al. Prevalence of cutaneous adverse events associated with long-term disease-modifying therapy and their impact on health-related quality of life in patients with multiple sclerosis: a cross-sectional study. *BMC Neurol*. 2013.
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

Significant Remaining Unmet Needs for Patients with MS

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**

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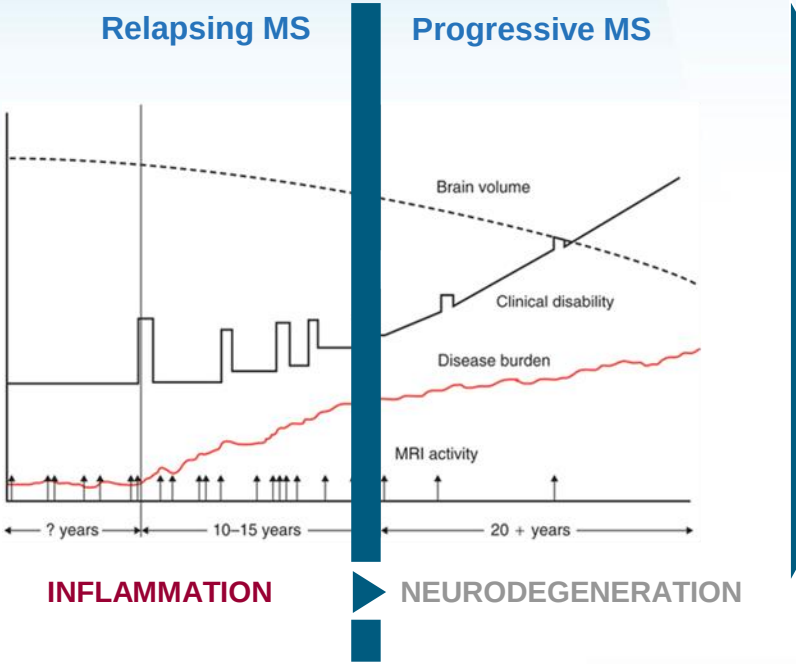
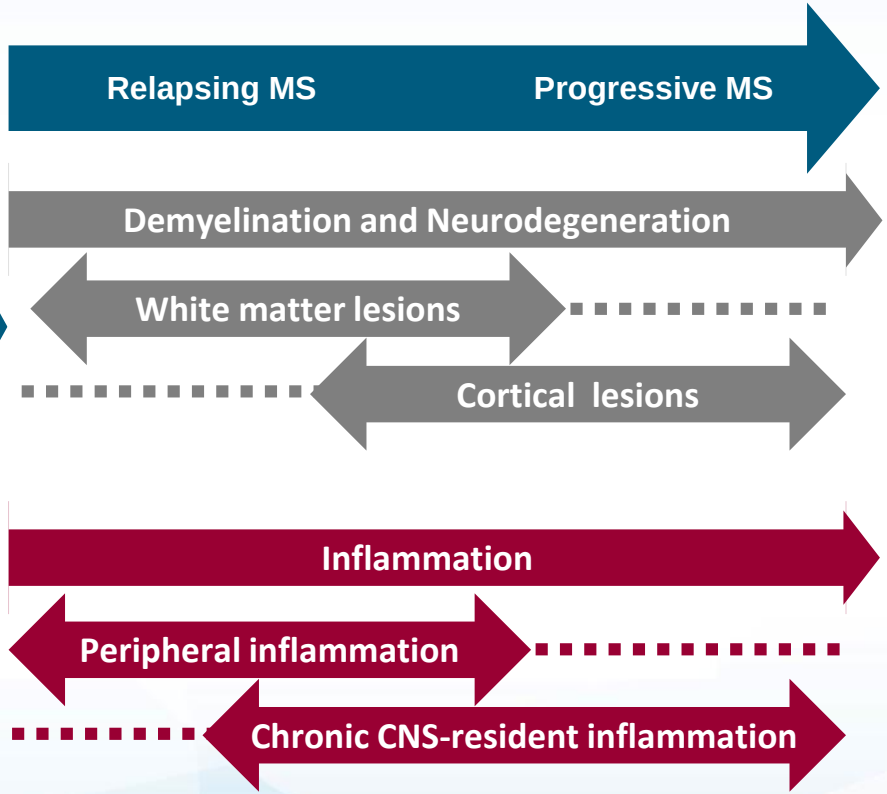
No Longer a Binary View of MS





Shift in disease paradigms…

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Drawing on Our MS Experience Coupled with Emerging Biology

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

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

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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

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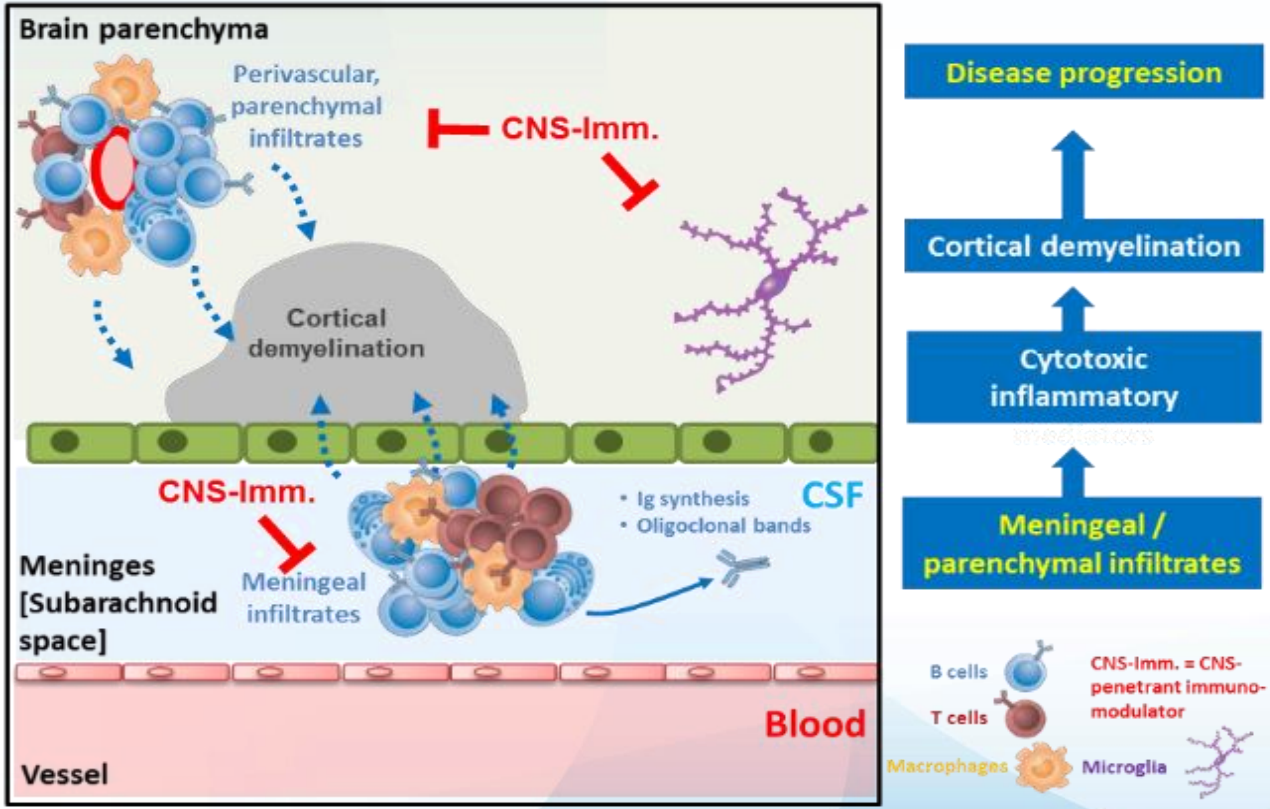
Targeting CNS-Compartmentalized Inflammation for Progressive Disease



Working to Improve Disability and Restore Function

Current pipeline:

Opicinumab anti-LINGO-1
(Phase 2b)

- Potential **first-in-class** therapy for CNS repair in MS through remyelination, resulting in improvement in disability
- Ongoing Phase 2b (AFFINITY) study: **Data expected mid-2020**

BIIB061
(Phase 2 Ready)

- Small molecule designed to promote differentiation of oligodendrocyte progenitors and enhance remyelination
- Planning to initiate **Phase 2 study in 2019**

Additional mechanisms
(Preclinical)

- Leveraging internal expertise and external collaboration to nominate and validate new targets
- Exploring multiple approaches and multiple modalities

Small molecule
Monoclonal antibody

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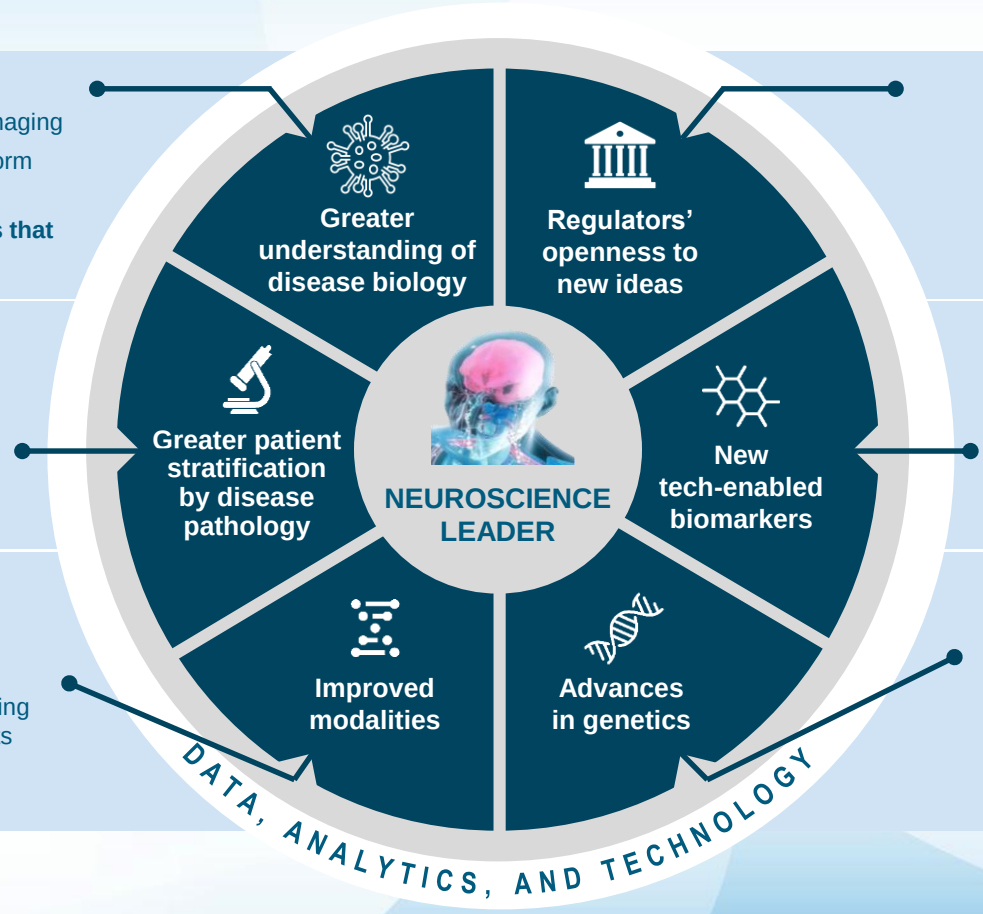
Building Core Capabilities to Increase Probability of Success

- 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

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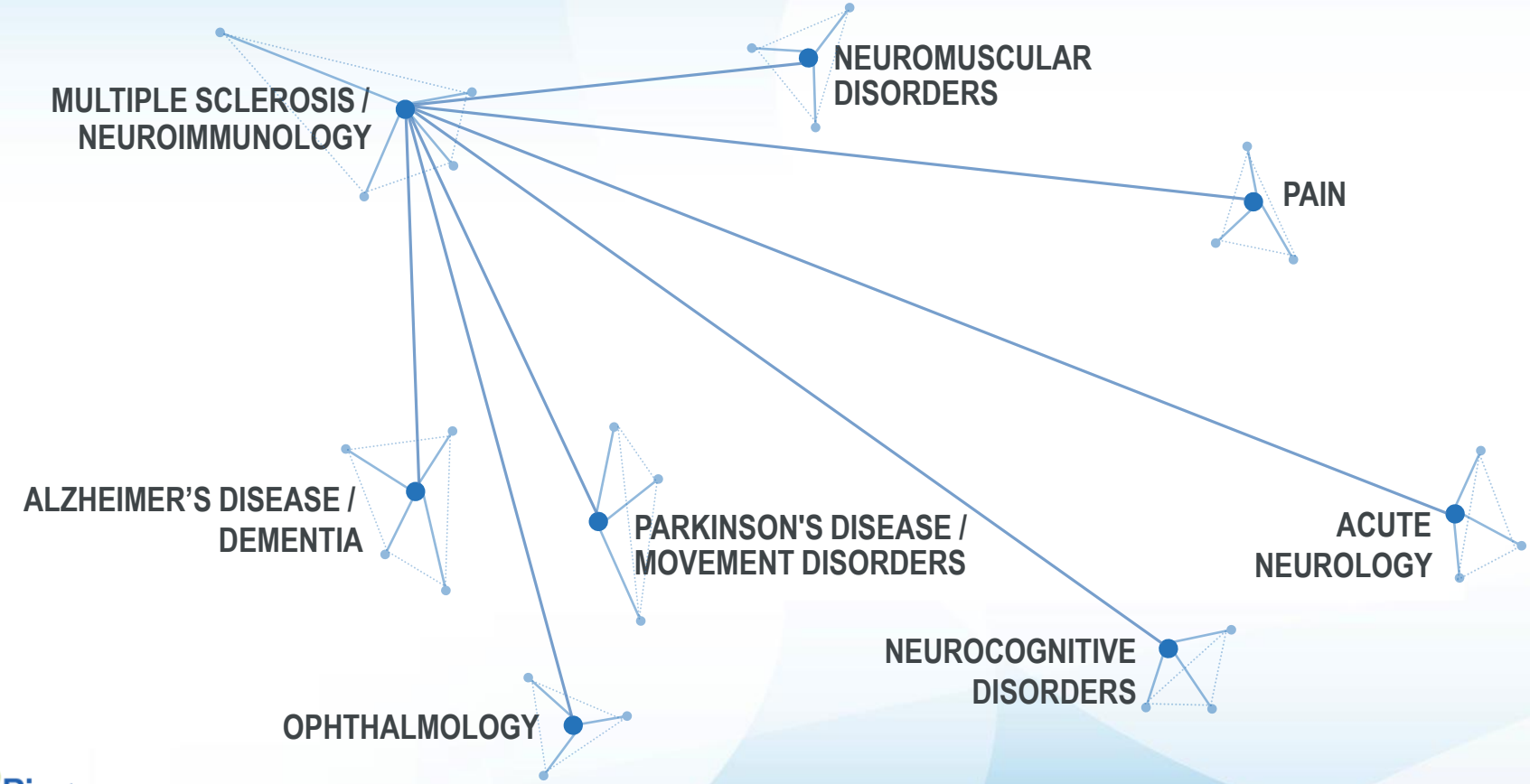
Leveraging our Depth in MS to Expand Neuroscience Leadership



Questions & Answers