Introduction to Ra Pharma & the Potential of Zilucoplan for the Treatment of IMNM

Webinar, November 6, 2019

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Ra Pharma®

Forward-Looking Statements

This presentation contains "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995, including, but not limited to, statements regarding the safety, efficacy, regulatory and clinical progress, and therapeutic potential of the product candidates of Ra Pharmaceuticals, Inc. ("Ra Pharma" or "we"), including zilucoplan, the poly(D,L-lactic-co-glycolic acid) (PLGA) and FluidCrystal® (FC) extended release (XR) formulations of zilucoplan, and an oral small molecule inhibitor of C5, plans and timing for the presentation of clinical data, expectations surrounding the trial design, timeline, and enrollment of Ra Pharma's ongoing and planned clinical programs, including a Phase 3 clinical program evaluating zilucoplan for the treatment of generalized myasthenia gravis (gMG), a Phase 2 trial of zilucoplan for the treatment of immune-mediated necrotizing myopathy (IMNM), and the Healey Center-led ALS platform trial, our market opportunities, and management's estimates about the potential size and characteristics for the patient populations that Ra Pharma's product candidates are targeting. Zilucoplan is an investigational drug, and the claims, or indications, discussed are not yet approved by the FDA. All such forward-looking statements are based on management's current expectations of future events and are subject to a number of risks and uncertainties that could cause actual results to differ materially and adversely from those set forth in or implied by such forward-looking statements. These risks and uncertainties include the risks that Ra Pharma's product candidates, including zilucoplan, the PLGA and FC XR formulations of zilucoplan, and an oral small molecule inhibitor of C5, will not successfully be developed or commercialized, risks related to fluctuations in Ra Pharma's stock price, as well as the other factors discussed in the "Risk Factors" section in Ra Pharma's most recently filed Annual Report on Form 10-K, as well as other risks detailed in Ra Pharma's subsequent filings with the Securities and Exchange Commission. There can be no assurance that the actual results or developments anticipated by Ra Pharma will be realized or, even if substantially realized, that they will have the expected consequences to, or effects on, Ra Pharma. Except as noted, all information in this presentation is as of November 6, 2019, and Ra Pharma undertakes no duty to update this information unless required by law.

A Brief History

Ra Pharma Overview

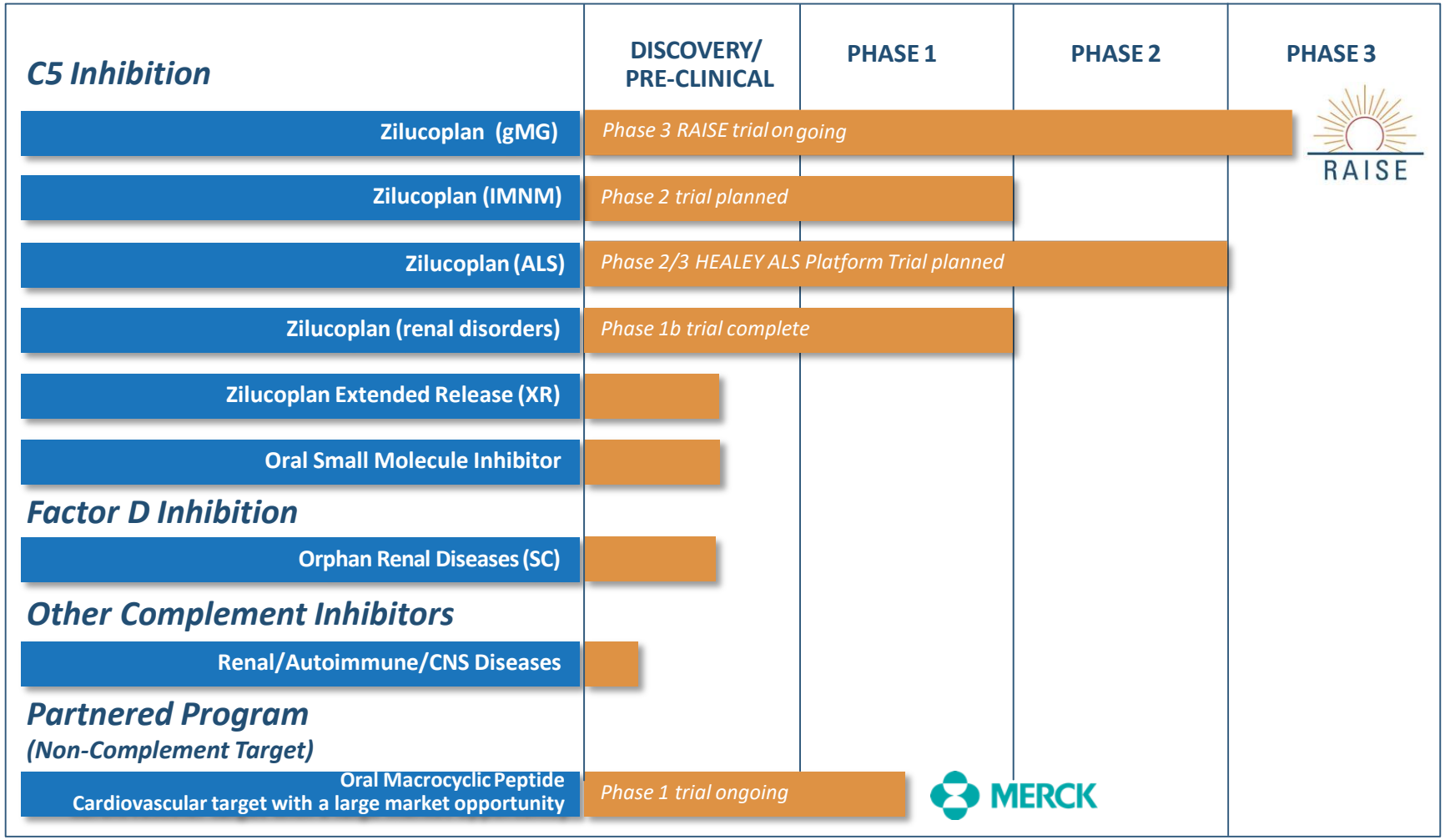
- Incorporated in 2008
- Located in Cambridge, MA
- Founded by Doug Treco (CEO) and Jack Szostak (MGH, 2009 Nobel Laureate)
- Currently ~75 employees
- Focused on rare diseases mediated by the complement system

Cambridge Park Drive | Cambridge, MA

Ra Pharma®

Leading the Field of Complement Biology to Bring Innovative and Accessible Therapies to Patients with Rare Diseases

Pipeline Programs



Zilucoplan

& Complement Inhibition

Ra Pharma

Zilucoplan: A Self-Administered, Subcutaneous, Macrocyclic Peptide Inhibitor of Complement C5

Multiple validated indications, pipeline-in-a-product potential

Alternative Pathway

Activated by non-self cells

C3

Factor D, Factor B

Classical Pathway

Activated by antibody-antigen complexes

C1q – C1r – C1s

Lectin Pathway

Activated by pathogen surfaces

C5

C5a

Proinflammatory cytokine

C5b

C6

C5b6

C7, C8, C9

Membrane attack complex (MAC)

Eculizumab (IV)

Binds C5, blocks cleavage

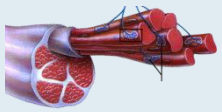
Zilucoplan (SC)

Binds C5, blocks cleavage; Blocks MAC assembly

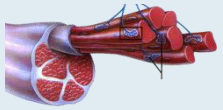
15 amino-acid cyclic peptide inhibitor of C5

Multiple Indications

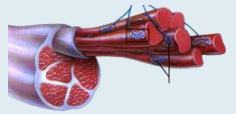
gMG: Phase 2 positive ✅
Phase 3 ongoing



IMNM: Phase 2 planned

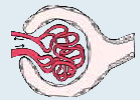


ALS: Platform trial planned



PNH: Phase 2 positive ✅

Renal Disorders: Phase 1b positive ✅



gMG – generalized myasthenia gravis; IMNM – immune-mediated necrotizing myopathy; ALS – amyotrophic lateral sclerosis; PNH – paroxysmal nocturnal hemoglobinuria

Designed for Everyday Control with Easy-to-Use Prefilled Syringe

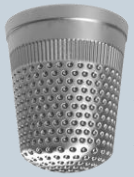
✓ **Short Injection**

~5 Seconds

✓ **BD UltraSafe™ PLUS**

Easy-to-use self-injection (used in approved products)

✓ **Small Volume**



~0.5 mL

~1/4 of a thimble

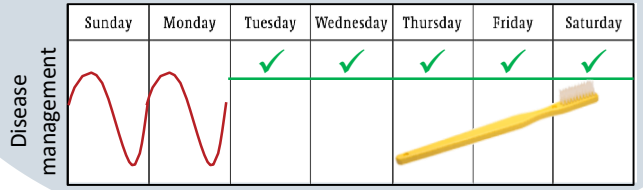
✓ **Convenience & Privacy**

Privacy of self administration at home and freedom to travel

Zilucoplan

✓ **Everyday Control**

Part of daily routine, like brushing your teeth or taking insulin injection



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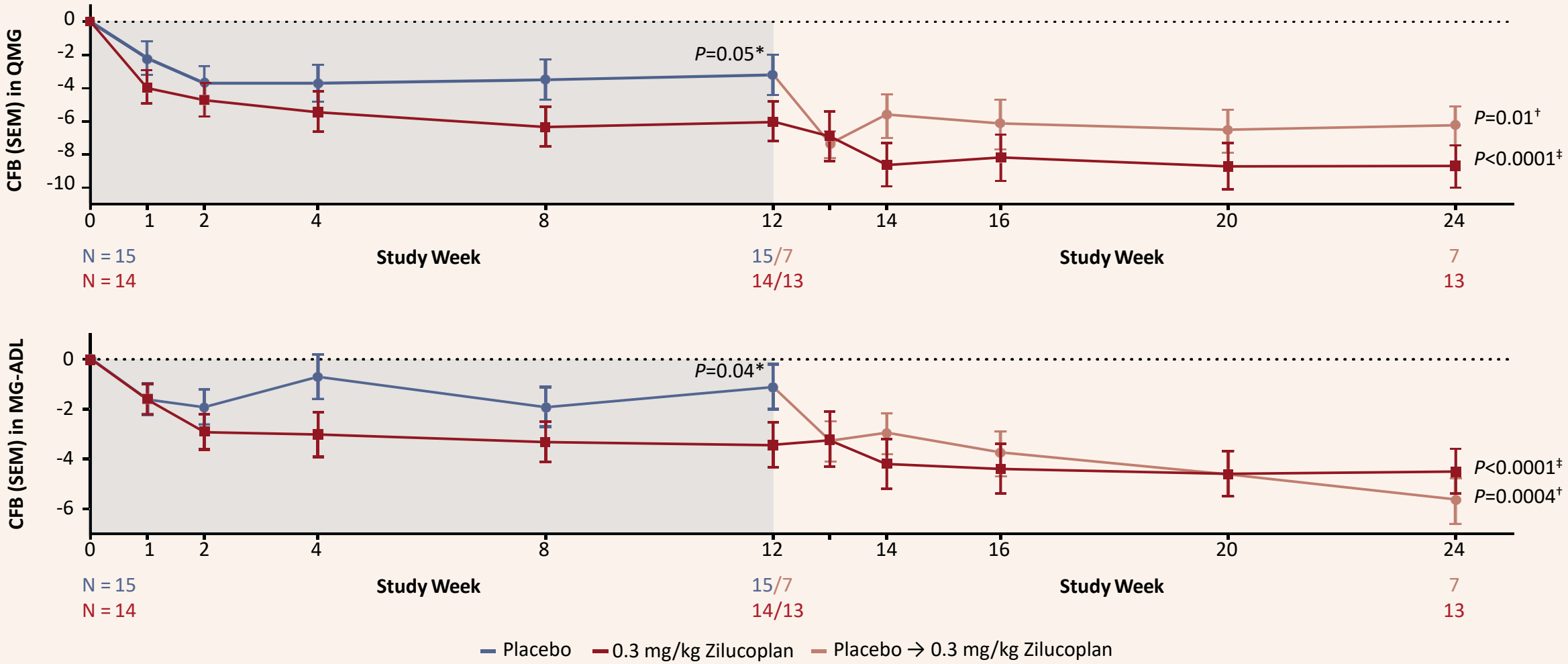
Phase 2 gMG

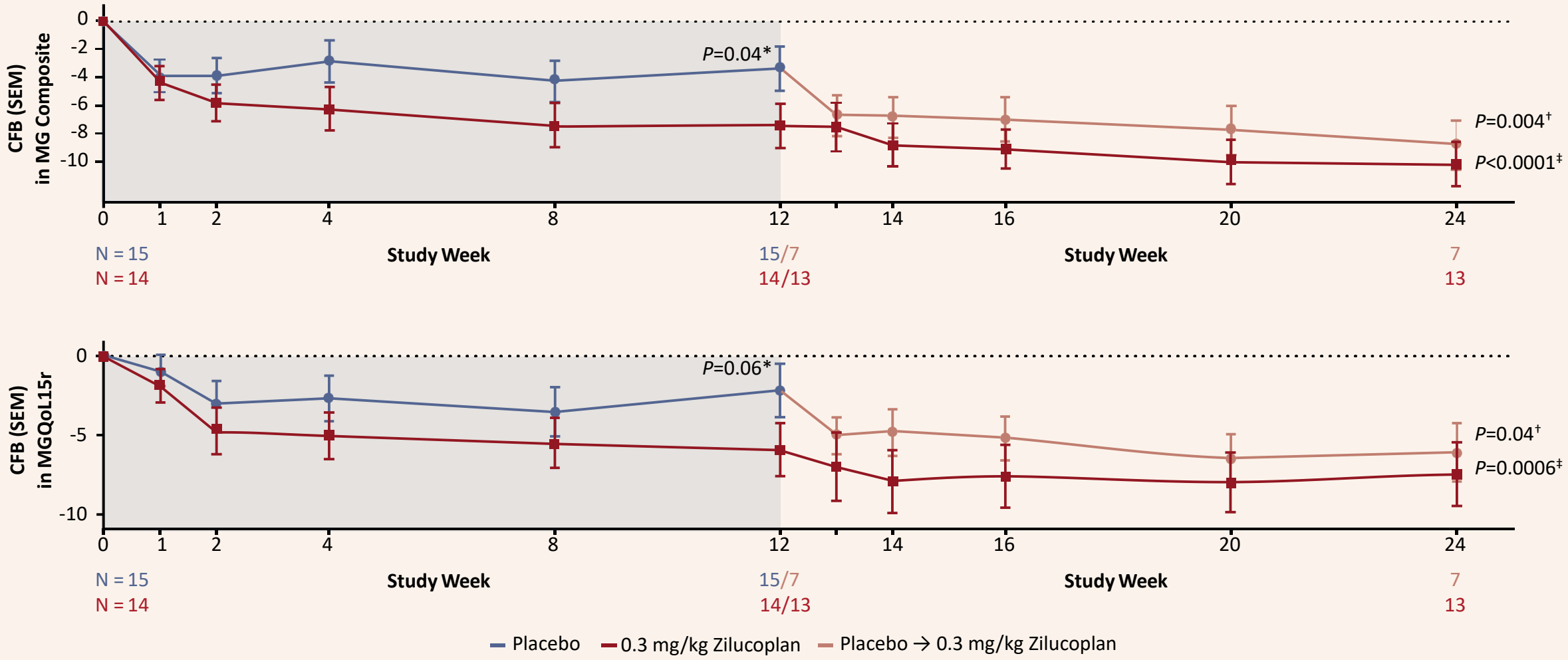
Top-line Results

Zilucoplan 0.3 mg/kg Achieved Rapid, Clinically Meaningful, Statistically Significant, and Sustained Reductions in QMG and MG-ADL



*1-sided analysis of covariance for LS mean change from baseline for 0.3 mg/kg arm vs. placebo; placebo patients re-baselined to zero upon completion of 12-week main study.
†2-sided t test for LS mean change from week 12 to week 24 for placebo patients crossing over to 0.3 mg/kg (n=7).
‡2-sided t test for LS mean change from week 0 to week 24 for 0.3 mg/kg arm.
CFB, change from baseline; LS, least squares; MG-ADL, Myasthenia Gravis Activities of Daily Living; QMG, Quantitative Myasthenia Gravis; SEM, standard error of the mean.

Zilucoplan 0.3 mg/kg Achieved Rapid, Clinically Meaningful, Statistically Significant, and Sustained Reductions in MG Composite and MGQoL15r



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CFB, change from baseline; LS, least squares; MGQoL15r, 15-item Myasthenia Gravis Quality-of-Life revised scale; SEM, standard error of the mean.

Phase 2 Safety and Tolerability Profile Support Continued Development

	Placebo (n=15)	Zilucoplan 0.1 mg/kg (n=15)	Zilucoplan 0.3 mg/kg (n=14)
Patients Requiring Rescue with IVIG or PLEX	**3 (20%)**	**1 (7%)**	**0 (0%)**
Patients with adverse events (AEs)	12	15	12
Patients with related AEs	3	8	3
Patients with serious AEs	3	0	5
Patients with related serious AEs	0	0	0
Patients with most common related AEs:			
Nausea	0	2	0
Injection site bruising	1	2	0
Injection site scab	0	3	0
Contusion	0	1	1
Headache	1	4	2
Patients with injection site reactions	2	4	3

No patients required rescue in 0.3 mg/kg zilucoplan arm

- No meningococcal infections
- Profile consistent with Ph1 and Ph2 PNH studies
- All 44 subjects completed 12-week study; No early withdrawals
- 42/44 subjects (95%) entered long-term extension

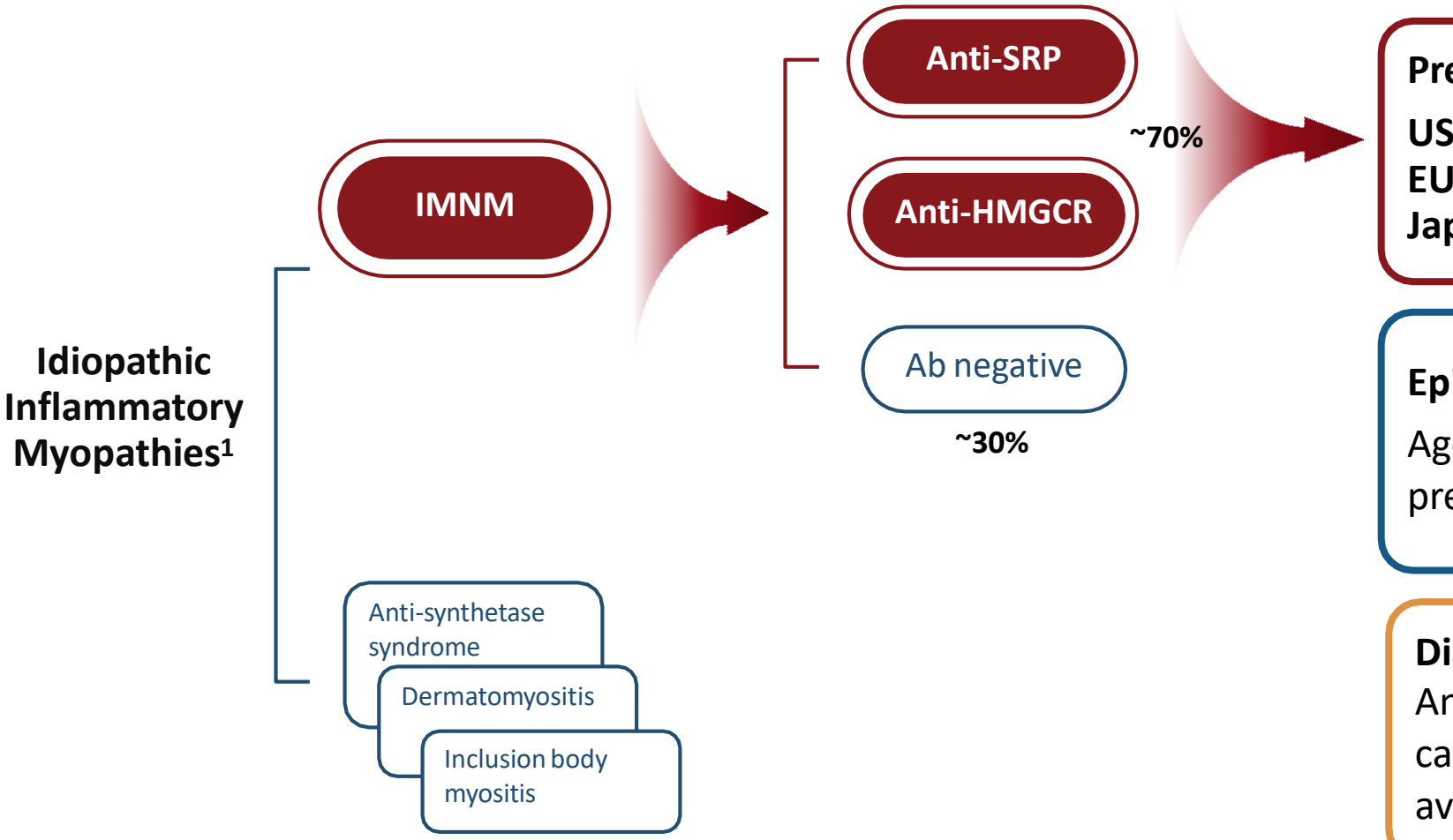
MedDRA Version 20.0 Adverse Event Preferred Terms; injection site reactions defined as pain, tenderness, erythema, or induration

IMNM

& Complement Inhibition

Ra Pharma

Immune-Mediated Necrotizing Myopathy (IMNM): A Distinct Idiopathic Inflammatory Myopathy



Prevalence: ~21/Million[2-10]

US: ~6,300 cases
EU: ~6,500 cases
Japan: ~2,500 cases

Epidemiology:

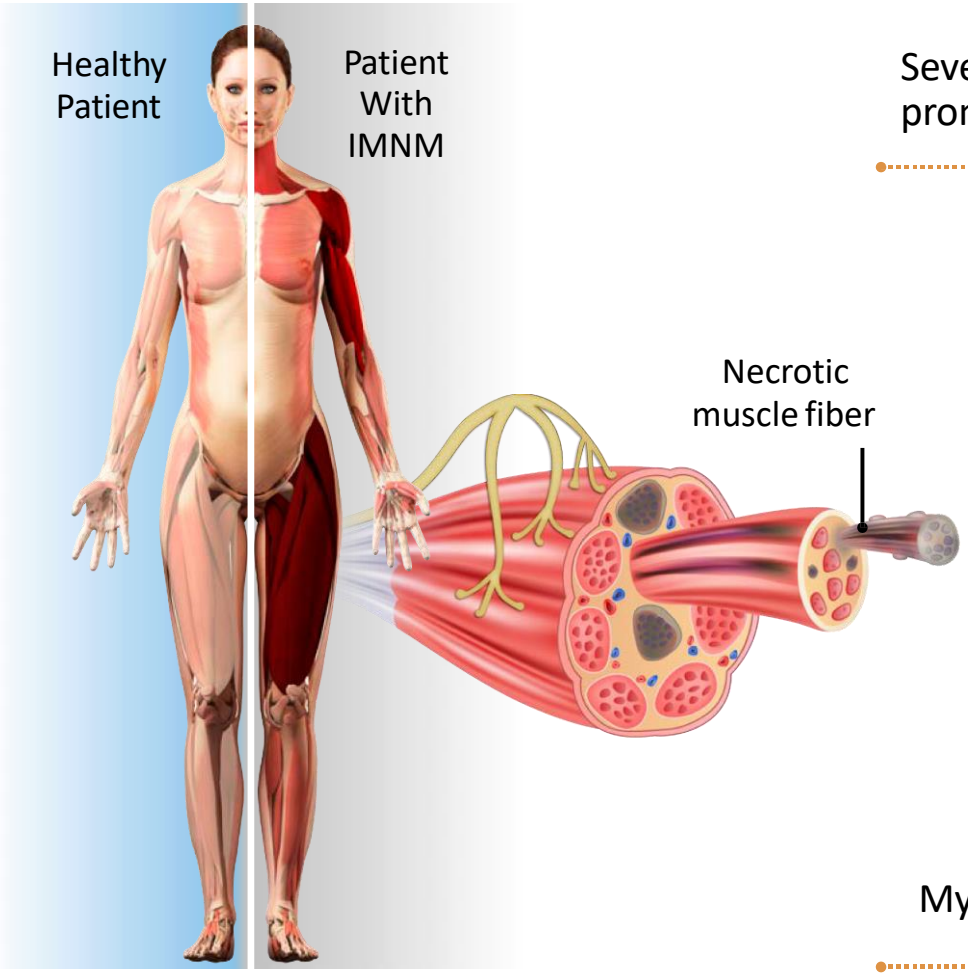
Age of onset, typically 40 to 60 years, predominantly affects females[5-7]

Diagnosis:

Anti-SRP and anti-HMGCR IMNM can be diagnosed with commercially-available antibody tests

1. Mariampillai K, et al. *JAMA Neurol*. 2018;75:1528-1537. **2.** Smoyer-Tomic KE, et al. *BMC Musculoskeletal Disorders.*2012;13:10. **3.** Dobloug C, et al. Ann Rheum Dis. 2017;74:1551-1556. **4.** Svennson J, et al. *Rheumatology*;2017;56:802-810. **5.** Pinal-Fernandez I, et al. *Arthritis Care Res.* 2017;69:263–270. **6.** Mammen AL, et al. *Arthritis Rheum*. 2011;63:713–721. **7.** Allenbach Y, et al. *Medicine*. 2014;93:150-157. **8.** Hengstman GJD, et al. *J Neurol.* 2002;249:69–75. **9.** Brouwer R, et al. *Ann Rheum Dis.* 2001;60:116–23. **10.** Watanabe Y, et al. *J Neurol Neurosurg Psychiatry*. 2016;87:1038–1044.

IMNM: A Severe and Debilitating Disease of Muscle Necrosis



Severe necrotizing myopathy with prominent complement deposition[1]

Severe proximal muscle weakness, especially in lower limbs[1]

Markedly elevated serum CK[1]

Muscle atrophy and fatty replacement[2]

Dysphagia[3]

Neck weakness[3]

Myalgia[3]

Anti-HMGCR subtype[4,5,6]

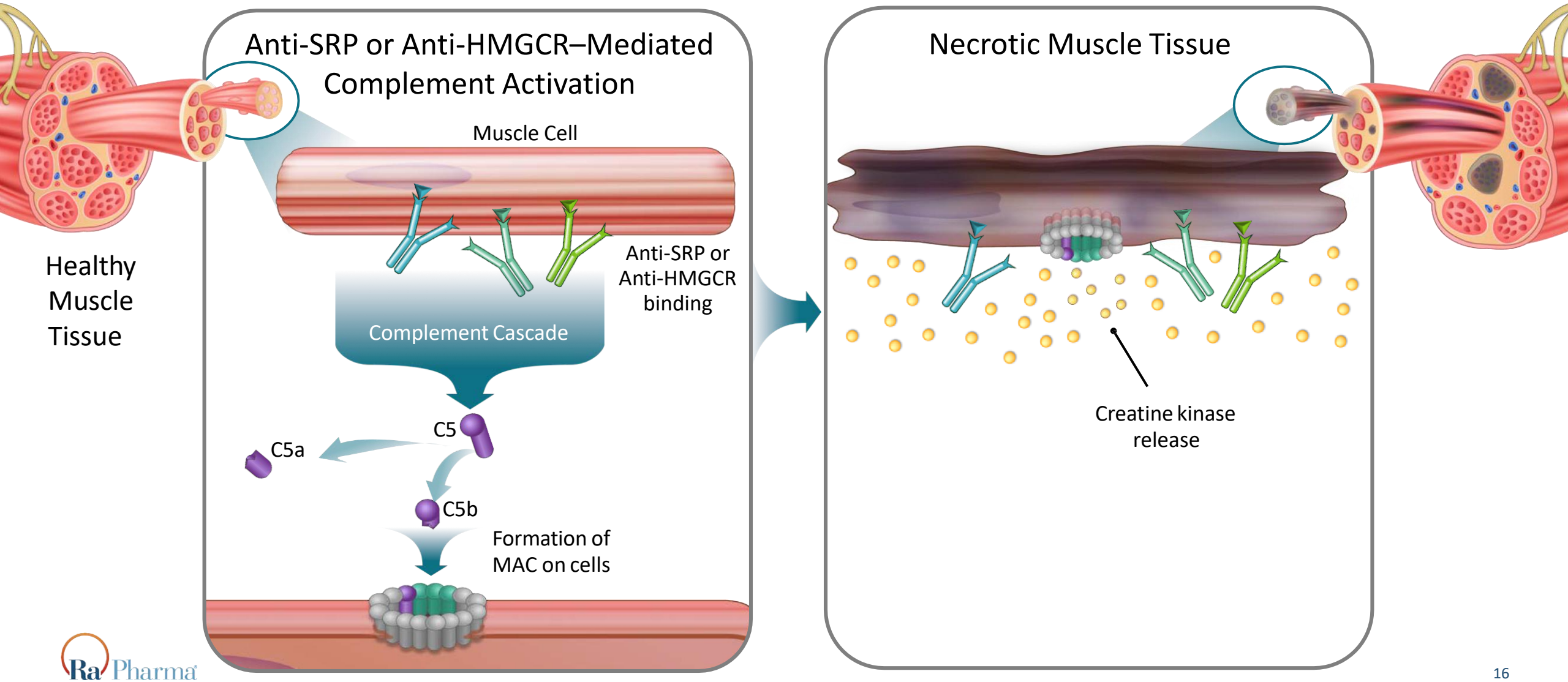
Associated with statin use in approximately 75% of patients

Anti-SRP subtype[3,4]

Associated with extra-muscular manifestations in approximately 10-20% of patients

1. Allenbach Y, et al. *Neuromuscul Disord*. 2018;28:87-99. **2.** Pinal-Fernandez I, et al. *Ann Rheum Dis*. 2017;76:681–687. **3.** Watanabe Y, et al. *J Neurol Neurosurg Psychiatry*. 2016;87:1038-1044. **4.** Pinal-Fernandez I, et al. *Arthritis Care Res;* 2017;69:263–270 . **5.** Allenbach Y, et al. *Brain*. 2016;39:2131-2135. 6. Mammen AL, et al. *Arthritis Rheum*. 2011;63:713-721.

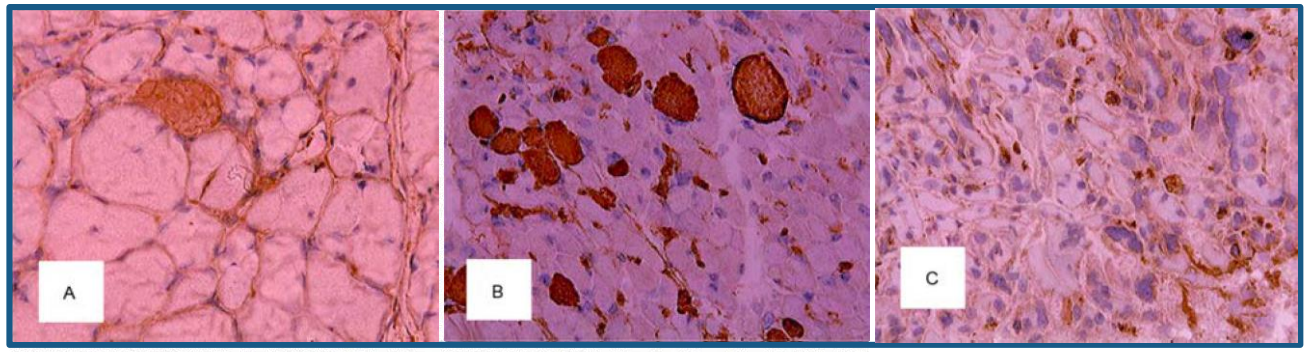
Anti-SRP and Anti-HMGCR Antibodies Initiate Complement-Mediated Tissue Damage in IMNM



Noris M, et al. *Semin Nephrol*. 2013;33:479-492.

Complement Plays a Central Role in the Pathophysiology of IMNM

Strong deposition of C5b-9 (MAC) in muscle fibers and blood vessels of patients with IMNM[1]

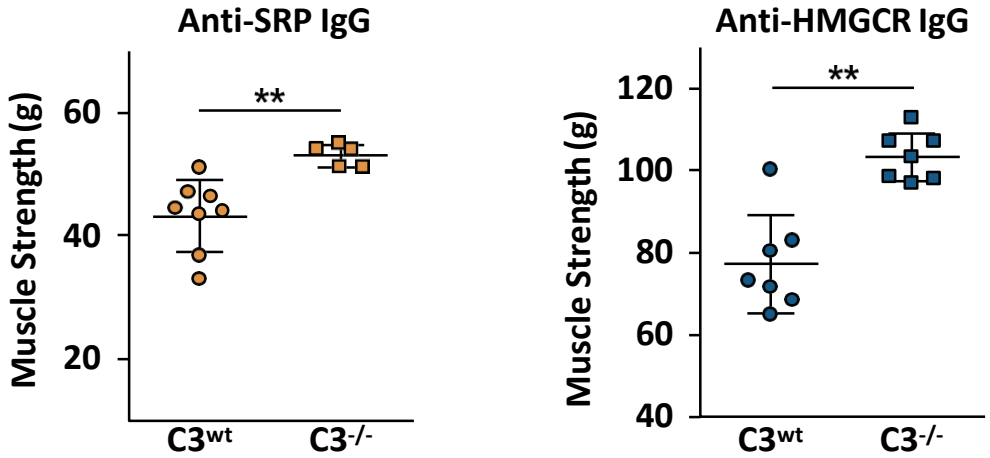


Muscle fibers | Muscle fibers | Capillaries

Phenotypic rescue of IMNM-induced muscle weakness in complement-deficient mice[2]

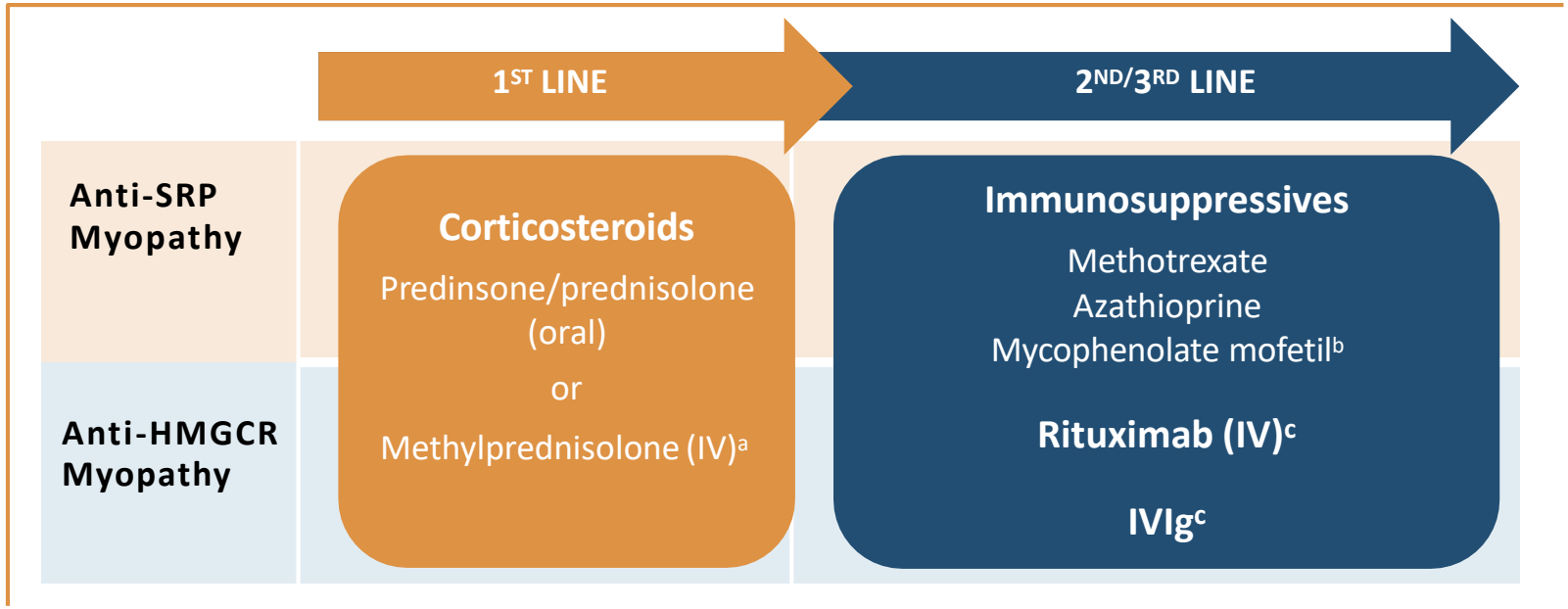
Muscle weakness in mice can be induced with sera from patients with IMNM[2]

Pathogenicity of patient serum is dependent on the presence of complement[2]



1. Cong L, et al. *Int J Clin Exp Pathol*. 2014;7:4143-4149. **2.** Bergua C, et al. *Ann Rheum Dis*. 2019;78:131-139.

Current Treatment Paradigm for IMNM Is Non-Specific and Inadequate



There are currently **no approved treatments** for IMNM[1]

Despite intense immunosuppression, **~52 - 66%** of patients show progression and incomplete recovery at two years[2]

Multiple specialties are involved in IMNM management

[a]Used in severe cases of IMNM.

[b]Azathioprine/mycophenolate mofetil may be used in the case of methotrexate intolerance.

[c]In patients with anti-SRP myopathy, methotrexate and rituximab are generally considered before IVIg. In patients with anti-HMGCR myopathy, methotrexate and IVIg are generally considered before rituximab; IVIg may be used as maintenance treatment on a case-by-case basis.

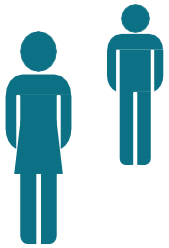
1. Allenbach Y, et al. *Neuromuscul Disord*. 2018;28:87-99. **2.** Day, J., et al. *Seminars in Arthritis and Rheumatism*. 2019;00:1-10.

IMNM
Phase 2 Study

Ra Pharma

Phase 2 Clinical Trial Will Evaluate the Potential of Zilucoplan for the Treatment of IMNM

Randomized, double-blind, placebo-controlled, multi-center study, followed by an open-label long-term extension

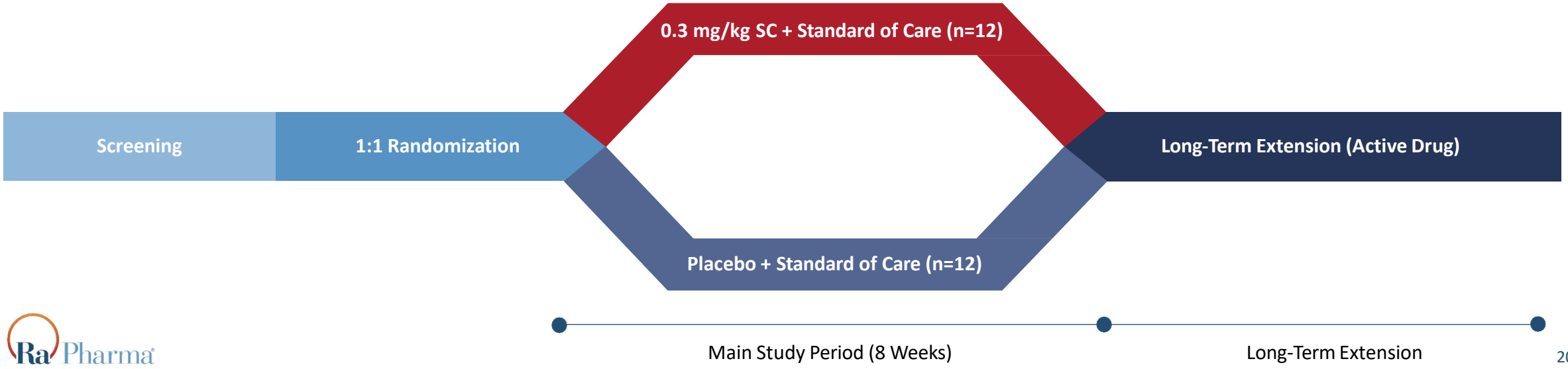


Broad Patient Population

- Clinical diagnosis of IMNM
- Autoantibody positive (HMGCR, SRP)
- MRC weakness of ≤ 4/5 in at least 1 proximal muscle group
- CK >1000 IU/L
- Stable doses of corticosteroids, immunosuppressants, or IVIg
- Vaccinated against meningococcus

Endpoints

- Primary endpoint: Change from baseline to week 8 in CK
- Secondary endpoints include functional assessments using validated measures, such as:
  - Triple Timed Up and Go (3TUG) Test
  - Proximal Manual Muscle Testing (MMT)
  - Physician and Patient Global Activity Visual Analogue Scales (VAS)
  - Health Assessment Questionnaire (HAQ)
  - Myositis Disease Activity Assessment Tool (MDAAT)



Phase 2 Clinical Trial Site Locations

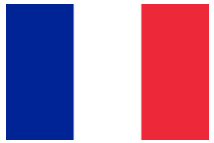
18 sites selected for participation

United States Locations:

- Bethesda, MD
- Boston, MA
- Orange, CA
- Westwood, KS
- St. Louis, MO
- Jacksonville, FL
- Columbus, OH
- Los Angeles, CA
- Tampa, FL
- Houston, TX
- Philadelphia, PA
- Great Neck, NY
- Memphis, TN

- Amsterdam

- Manchester
- London



- Paris

For more information, contact:
trials@rapharma.com