BENITEC BIOPHARMA

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CORPORATE PRESENTATION

June 2022

Safe Harbor Statement

This presentation contains "forward-looking statements" within the meaning of section 27A of the US Securities Act of 1933 and section 21E of the US Securities Exchange Act of 1934. Benitec has tried to identify such forward-looking statements by use of such words as "expects," "intends," "hopes," "anticipates," "believes," "could," "may," "evidences" and "estimates," or the negative of these terms, and other similar expressions, but these words are not the exclusive means of identifying such statements. Such statements include, but are not limited to, any statements relating to Benitec's pipeline of ddRNAi-based therapeutics, including the initiation, progress and outcomes of clinical trials and any other statements that are not historical facts. Such forward-looking statements involve risks and uncertainties, including, but not limited to, risks and uncertainties relating to the difficulties or delays in our plans to develop and potentially commercialize our product candidates, the timing of the initiation and completion of pre-clinical and clinical trials, the timing of patient enrollment and dosing in clinical trials, the timing of expected regulatory filings, the clinical utility and potential attributes and benefits of ddRNAi and our product candidates, potential future out-licenses and collaborations, our intellectual property position and duration of our patent portfolio, the ability to procure additional sources of financing, unanticipated delays, further research and development and the results of clinical trials possibly being unsuccessful or insufficient to meet applicable regulatory standards or warrant continued development, the ability to enroll sufficient numbers of subjects in clinical trials, determinations made by the US Food and Drug Administration and other governmental authorities, Benitec's ability to protect and enforce its patents and other intellectual property rights, Benitec's dependence on its relationships with its collaboration partners and other third parties, the efficacy or safety of Benitec's products and the products of Benitec's collaboration partners, the acceptance of Benitec's products and the products of Benitec's collaboration partners in the marketplace, market competition, sales, marketing, manufacturing and distribution requirements, greater than expected expenses, expenses relating to litigation or strategic activities, Benitec's ability to satisfy its capital needs through increasing its revenue and obtaining additional financing, the impact of the current COVID-19 pandemic, the disease caused by the SARS-CoV-2 virus, which may adversely impact Benitec's business and pre-clinical and future clinical trials, the impact of local, regional, and national and international economic conditions and events, and other risks detailed from time to time in filings that Benitec makes with the US Securities and Exchange Commission, including our most recent annual report on Form 10-K and our reports on Form 8-K. Such statements are based on management's current expectations, but actual results may differ materially due to various factors, including those risks and uncertainties mentioned or referred to in this presentation. Accordingly, you should not rely on those forward-looking statements as a prediction of actual future results. Benitec disclaims any intent or obligation to update these forward-looking statements, except as required by law.

Company Highlights

Novel ddRNAi Technology Platform	• DNA-directed RNA interference (ddRNAi) platform combines gene therapy with RNA interference to simultaneously silence & replace disease-causing genes permanently following a single administration • ddRNAi platform can potentially treat diseases that cannot be addressed with either gene silencing or gene therapy alone
Lead Asset Targeting Oculopharyngeal Muscular Dystrophy (OPMD): BB-301	• BB-301 is a gene therapy designed to treat dysphagia in patients with OPMD, an orphan indication with an estimated 15k patient prevalence in the U.S., Europe, Canada, and Israel • OPMD drives muscle atrophy, muscle cell death and fibrosis, leading to a debilitating clinical phenotype characterized by progressive loss of swallowing capacity, eyelid drooping, proximal limb weakness, and potentially death due to aspiration pneumonia and malnutrition
Compelling Preclinical Data Support the BB-301 First-in-Human Clinical Trial	• Following robust preclinical results, clinical development program will begin in 3Q22 with clinical data from the first-in-human (FIH) safety and efficacy study available in 2H23 • Preclinical data for BB-301 in the core OPMD murine model demonstrated complete restoration of the native phenotype at 14-weeks following a single intramuscular administration • Large animal study corroborated murine data and validated route of administration for FIH study
Near Term Milestones	• Natural history study to begin 3Q22; first patient dosed with BB-301 2Q23; initial safety and efficacy data 2H23
Seasoned Management	• Led by Jerel A. Banks, M.D., Ph.D., a healthcare investment professional with over 15 years experience • Team has broad expertise in gene therapy development, biological manufacturing, and capital allocation

DNA-directed RNA Interference (ddRNAi) Platform Simultaneously Silences & Replaces Disease-Causing Genes

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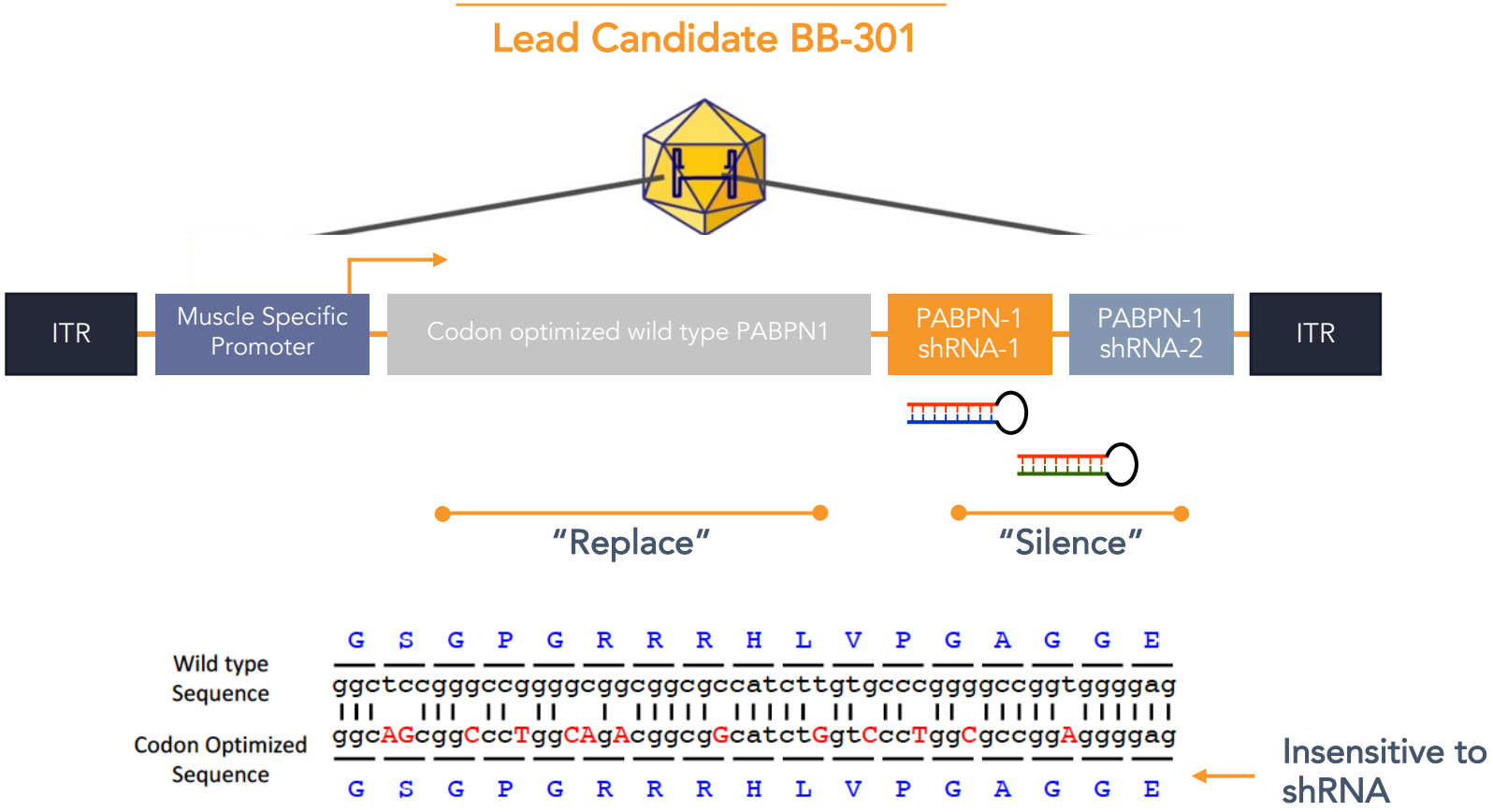
Benitec's technology simultaneously silences mutant proteins *and* delivers wild type replacement genes to restore normal cell function

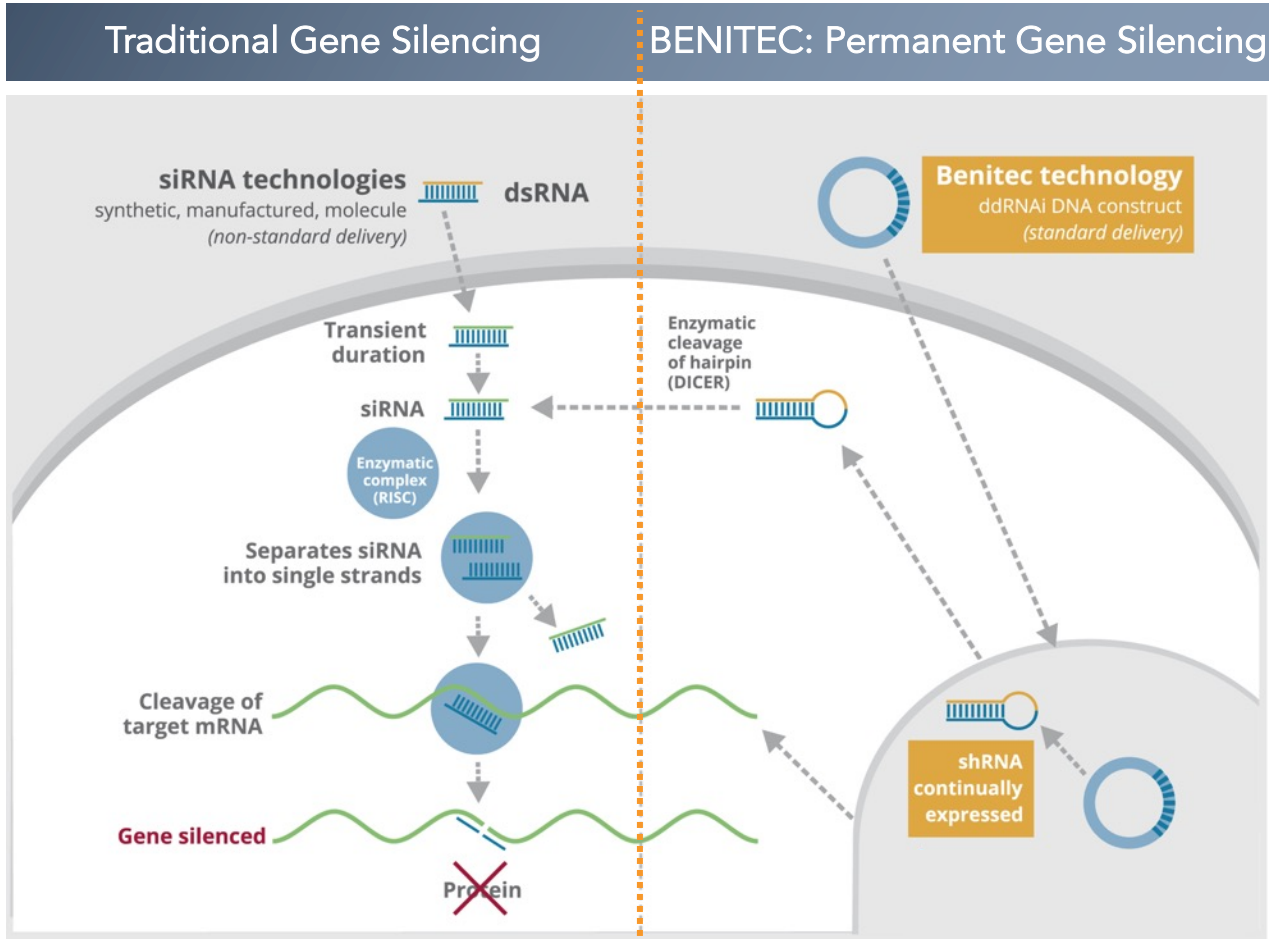
Competitive Advantage

For some genetic diseases, it is impossible to silence disease-causing genes without also silencing vital normal proteins

Benitec's platform can potentially treat diseases that cannot be treated with gene silencing alone



ddRNAi Produces Constant Levels of shRNA Expression in Target Tissues to Permanently Silence Genes



Advantages of Permanent Gene Silencing

- Combines RNA interference with gene therapy delivery
- Long-term therapeutic potential from a single administration
- Constant, steady-state levels of shRNA expression
- Silence a single gene or multiple genes simultaneously

Executive Team

Expertise in Gene Therapy Development, Biological Manufacturing, and Capital Allocation

Jerel A. Banks, M.D., Ph.D.
CEO and Executive Chairman

- Healthcare investment professional with over 15 years of experience
- Former vice president and co-portfolio manager at Franklin Templeton Investments
- M.D. and Ph.D. from Brown University, and A.B. in Chemistry from Princeton University

Megan Boston
Executive Director

- CEO and Managing Director of ASX listed entities
- Chartered Accountant with over 20 years of experience
- Held senior executive roles at various banking institutions in the area of risk and compliance, as well as PricewaterhouseCoopers

Claudia Kloth, Ph.D.
SVP of Manufacturing

- 20+ years of cGMP manufacturing and process development experience in therapeutics
- Led Process Development group at Lonza Viral Therapeutics
- Developed, optimized and transferred robust viral-based products (Ad5, AAV, lentivirus) to cGMP manufacturing
- Guided process transfer and process validation activities of Yervoy (Bristol-Myers Squibb)

BB-301: Gene Therapy for Oculopharyngeal Muscular Dystrophy (OPMD), Debilitating, Progressive Disease with No Approved Therapeutic Options

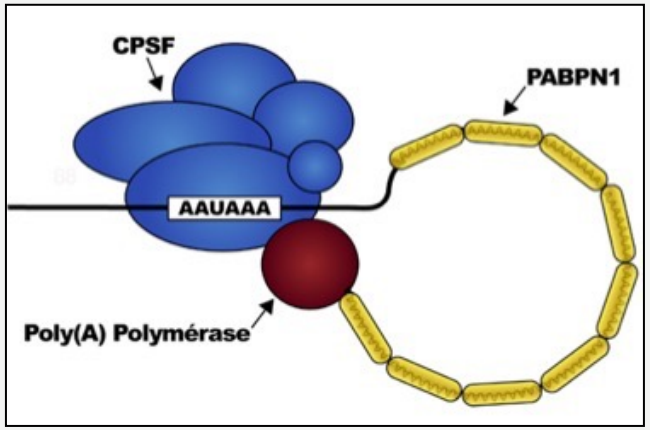
Oculopharyngeal Muscular Dystrophy	• Rare, autosomal dominant, monogenic disease (caused by mutant PABPN1 gene) • Estimated prevalence of 15k adults (40-60 years old) in Europe, Canada, Israel, and the U.S. • Drives muscle atrophy, muscle cell death and fibrosis, leading to a debilitating clinical phenotype characterized by progressive loss of swallowing capacity, eyelid drooping, proximal limb weakness, and potentially death due to aspiration pneumonia and malnutrition • No therapeutics approved or under development for OPMD; only palliative surgical procedures exist
BB-301	• Designed to treat dysphagia associated with OPMD • 'Silence': Inhibits mutant and wild type PABPN1 gene expression • 'Replace': Simultaneously reintroduces wild type PABPN1 gene to restore normal cellular function • Preclinical studies completed in 2021; OPMD clinical development program to initiate in 3Q22
Commercial Opportunity	• Benitec retains global rights to BB-301, with prevalence estimates and established global reimbursement paradigms for orphan and gene therapies supporting a multi-billion dollar commercial opportunity over the life of the product • Orphan Drug Designation granted in the U.S. and EU • Commercial-scale manufacturing for BB-301 optimized and reproducibly executed during large animal studies

Genetic Basis of OPMD: Trinucleotide Repeat Expansion at PABPN1 Exon 1

WT ATG $(GCG)_6$ ----------$(GCA)_3$ GCG GGG GCT GCG..
MUT ATG $(GCG)_6$ $(GCG)_{1-7}$ $(GCA)_3$ GCG GGG GCT GCG…--

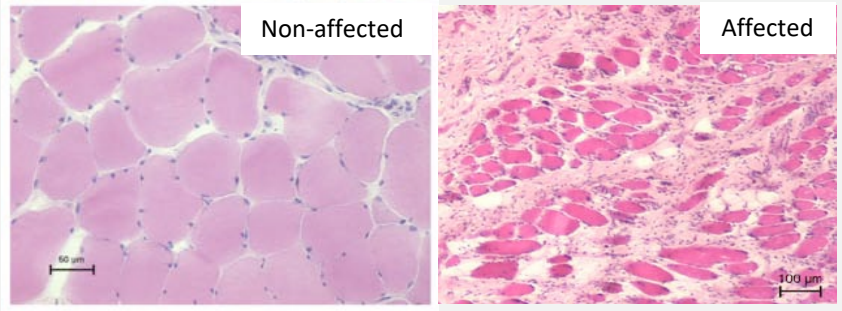
PABPN1

Ubiquitous factor that promotes interaction between the poly(A) polymerase and CPSF (cleavage and polyadenylation specificity factor) and thus, controls the length of mRNA poly(A) tails, mRNA export from the nucleus, and alternative poly(A) site usage



In OPMD

- Genetic mutation results in trinucleotide repeat expansion within exon 1 of PABPN1 and results in an expanded poly-alanine tract at the N-terminal end of PABPN1
- Mutation generates a protein with an N-terminal expanded poly-alanine tract of up to 18 contiguous alanine residues prone to form aggregates called intranuclear inclusions (INIs)
- INIs that also sequester wild type PABPN1 could contribute to the "loss of function" phenotype associated with OPMD



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PRECLINICAL RESULTS:

A17 MOUSE MODEL

BB-301 Silenced and Replaced Mutant PABPN1 Over a Broad Range of Doses in Murine Models

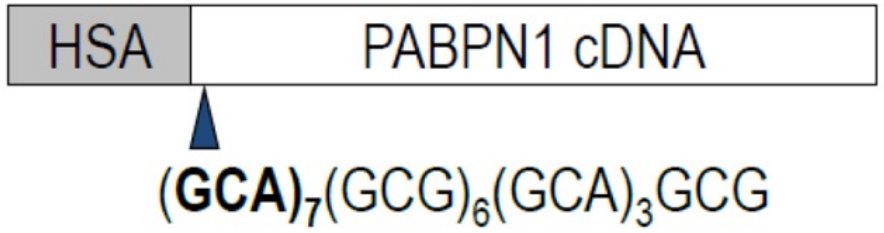
Study Design

BB-301 was injected into the Tibialis Anterior (TA) muscle of 10 week old-to-12 week old A17 mice (a transgenic mouse model for OPMD), and 14-weeks post administration each A17 cohort was anesthetized and the contractile properties of the injected TA muscles were analyzed via in-situ muscle electrophysiology

Conclusion

PABPN1 inhibition levels of 31% or higher led to complete resolution of OPMD disease symptoms and correction of OPMD histological hallmarks

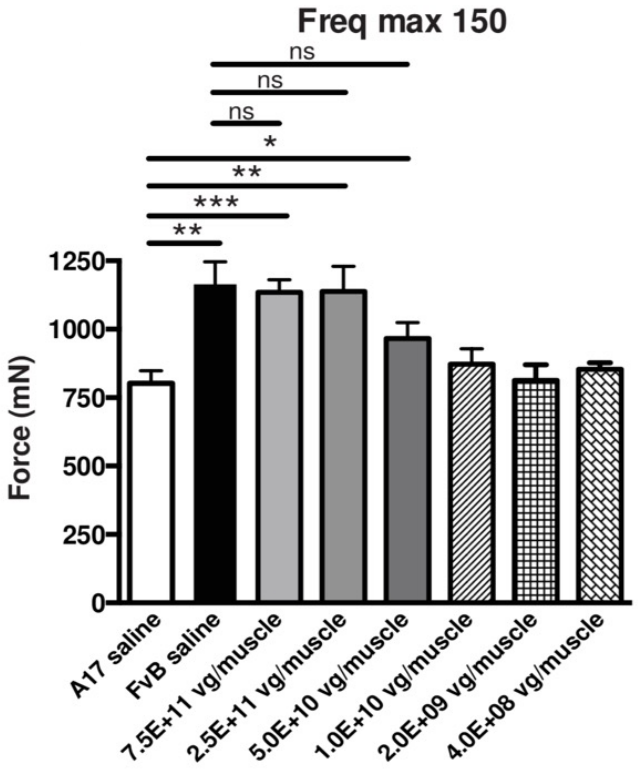
Transgenic Genome of the A17 Mouse Model

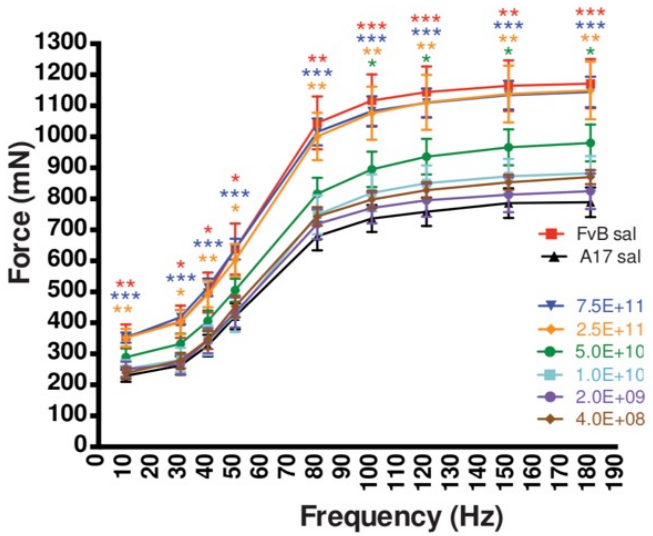


	"Silence"	"Replace"
BB-301 Dose (vg)	PABPN1 Inhibition	coPABPN1 Expression
7.50E+11	86%	63%
2.50E+11	75%	26%
5.00E+10	31%	2%
1.00E+10	32%	1%
2.00E+09	14%	0%
4.00E+08	0%	0%

BB-301 Restored Muscle Strength to Wild Type Levels in Murine Models

- Varying levels of inhibition of PABPN1 expression, when coupled with partial replacement of wild type PABPN1 significantly:
  - reduced INIs
  - increased muscle strength
  - corrected disease phenotype
- Statistically significant improvements in muscle strength (vs. saline-injected animals) and complete phenotypic correction were observed at the $2.5x10^{11}$ vg/muscle dose which reduced PABPN1 expression by 75% and supported replacement of wild type protein at 26% of normal levels





Restoration of muscle strength was assessed by muscle contractility measurements in response to a series of induced impulses that ranged from 10 to 180 Hz; Strings-Ufombah, et al., Molecular Therapy: Nucleic Acids, Vol. 24, 67-78, June 2021

CTA-Enabling and IND-Enabling Studies for BB-301

Pilot study to determine dosing and muscle transduction	• 8-week Pilot Dosing study in Beagle dogs to confirm the transduction efficiency of BB-301 following direct intramuscular injection into the pharyngeal muscles via the use of an open surgical approach • The pharyngeal muscles injected in Beagle dogs (i.e., Hypopharyngeus (HP) muscles and Thyropharyngeus (TP) muscles) correspond to the pharyngeal muscle dosing targets for human OPMD subjects (i.e., Middle Pharyngeal Constrictor muscles and Inferior Pharyngeal Constrictor muscles, respectively)
Toxicology study	• 12-week GLP Toxicology and Biodistribution study in Beagle dogs

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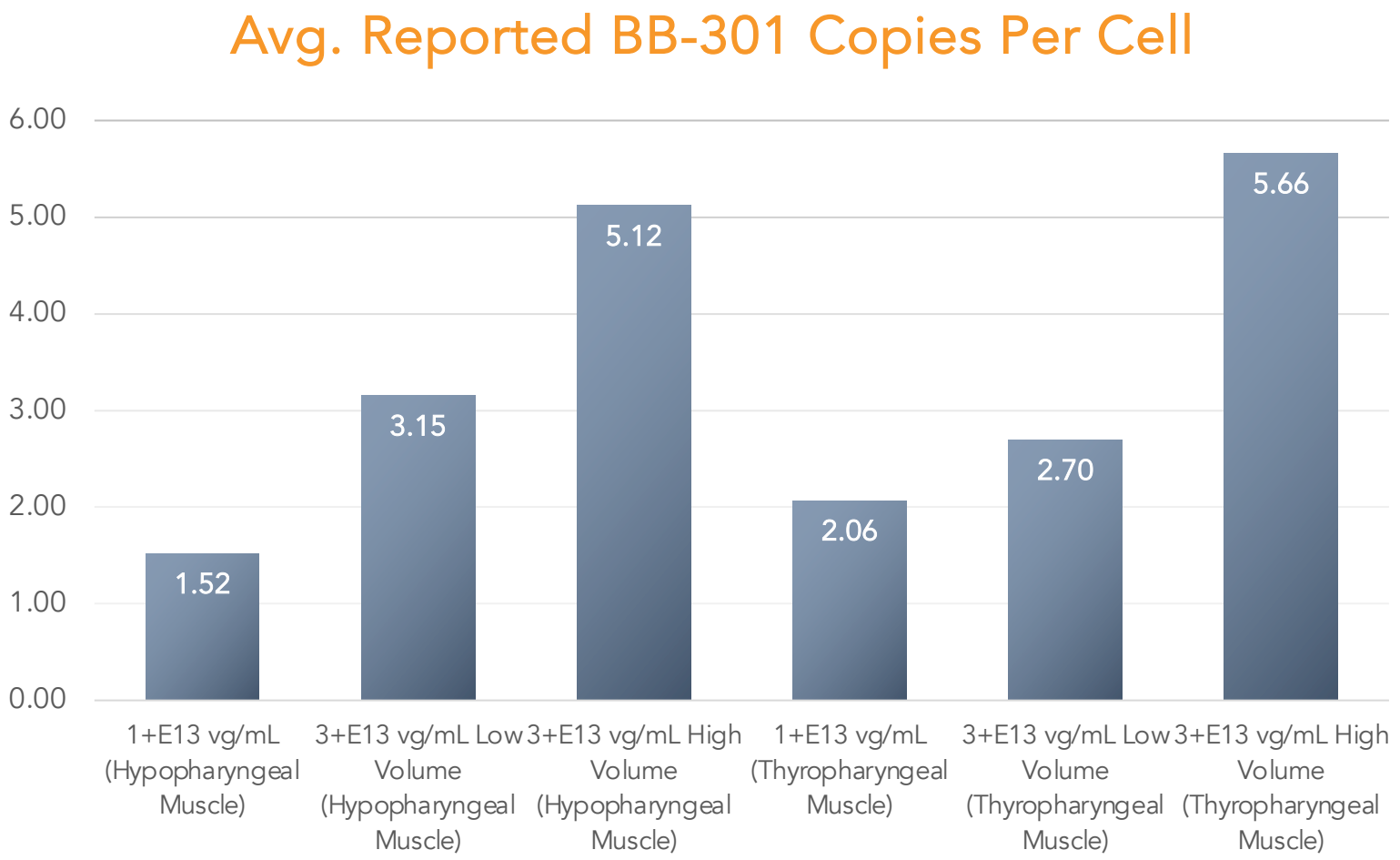
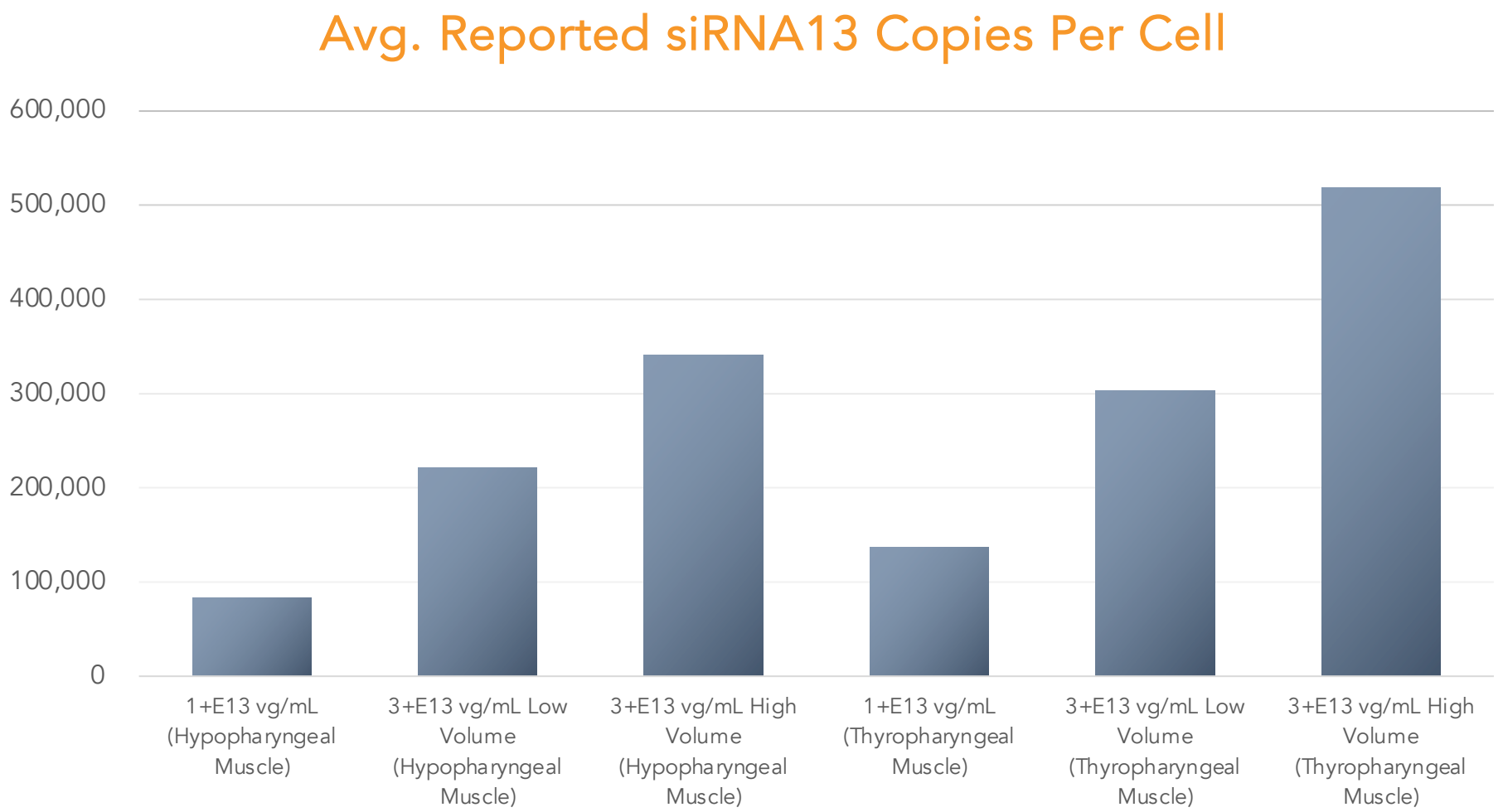
PRECLINICAL RESULTS: PILOT DOSING STUDY IN BEAGLE DOGS

Successful, Dose-dependent Transduction of BB-301 in Target Tissue

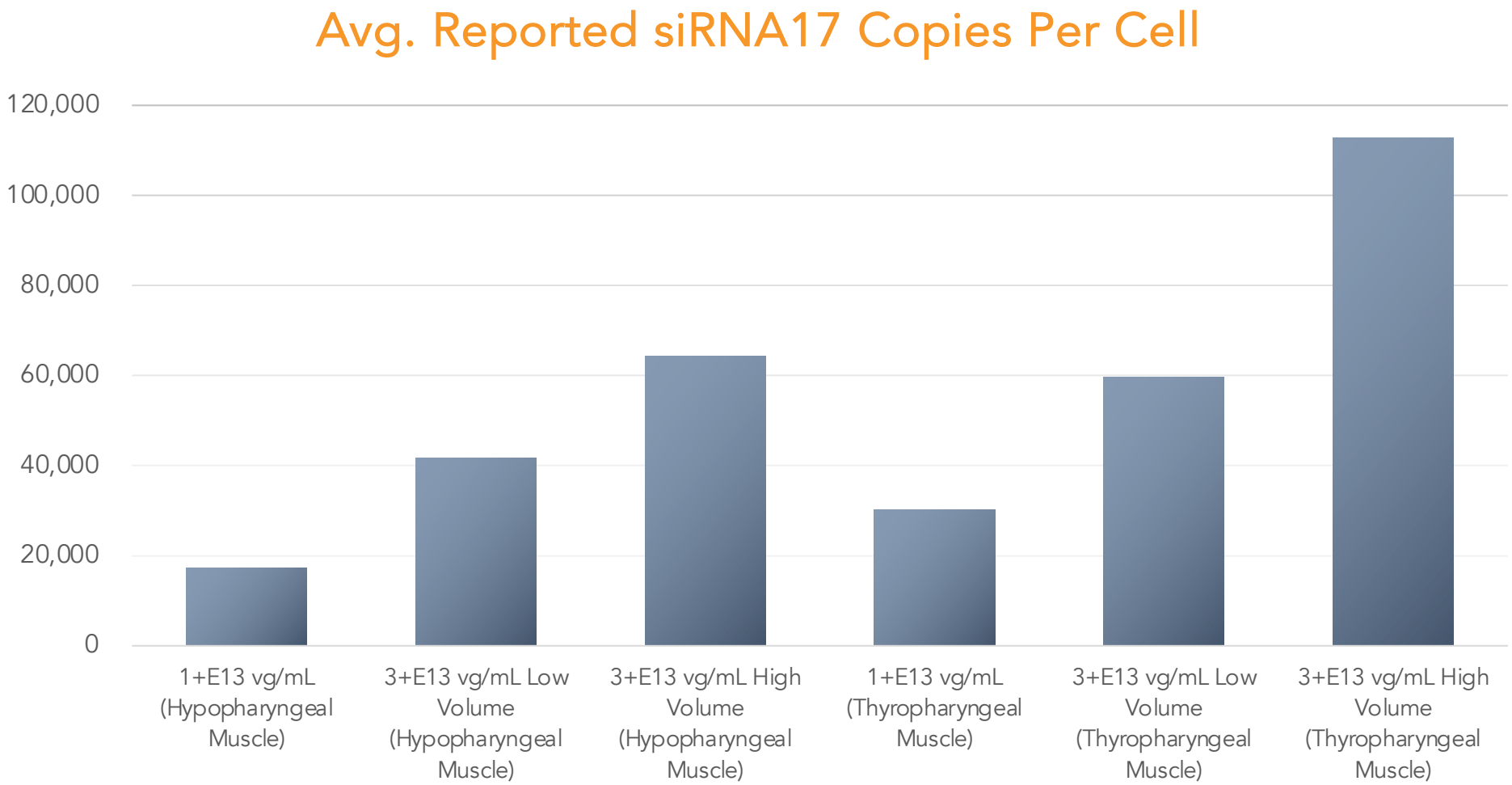
The data demonstrate biologically significant, dose-dependent levels of BB-301 tissue transduction (i.e., delivery of the multi-functional genetic construct into the target pharyngeal muscle cells)



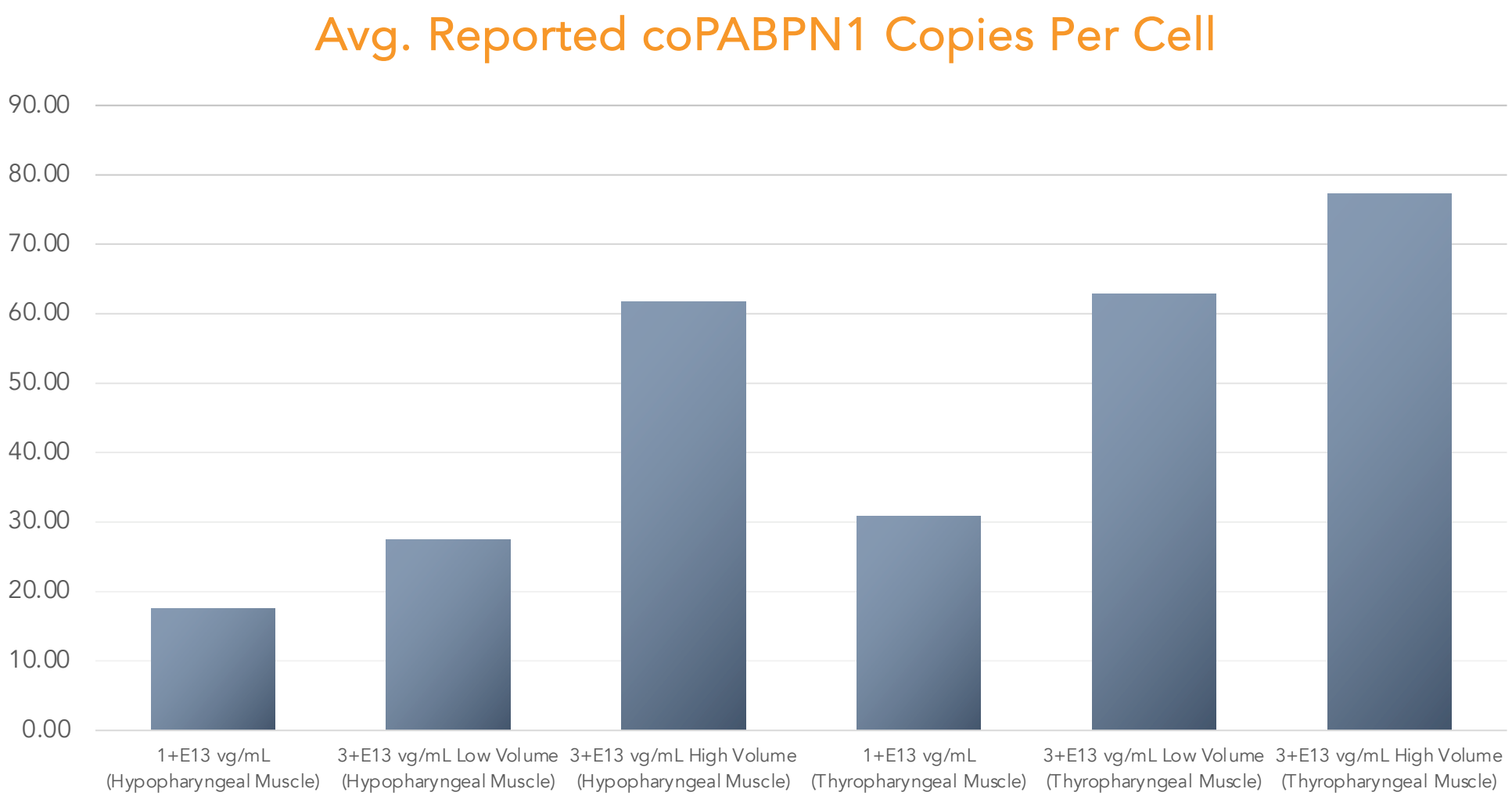
Broad-based, Dose-dependent Expression of siRNA13 in Target Tissue



Broad-based, Dose-dependent Expression of siRNA17 in Target Tissue



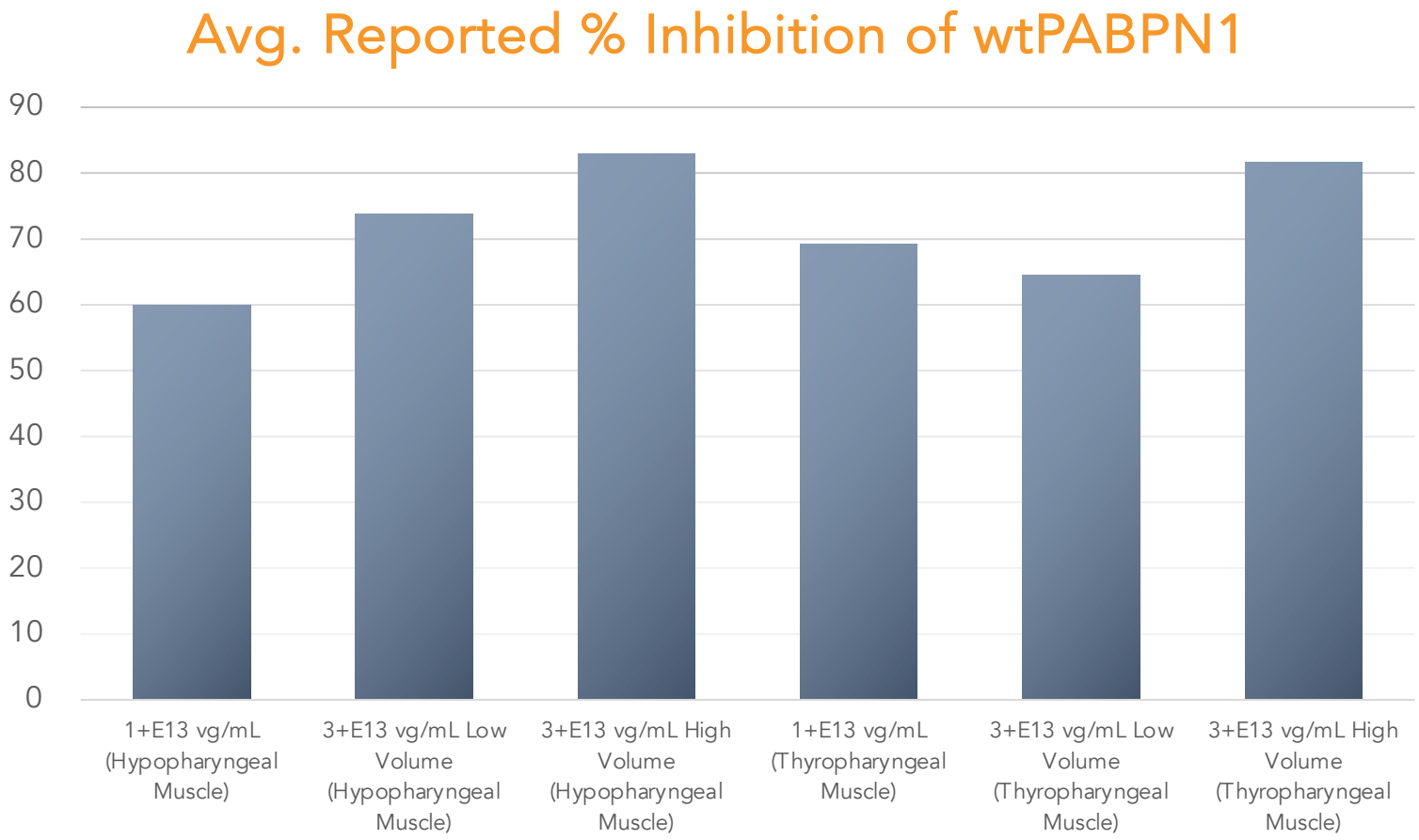
Broad-based, Dose-dependent Expression of coPABPN1 in Target Tissue



Consistent Inhibition of Wild Type PABPN1 at All Dose Levels

Analysis at 8-weeks revealed durable and biologically significant levels of target gene knock-down within the pharyngeal muscle cells

The average level of inhibition observed across all doses was 72%



BB-301 Clinical Program

Characterization of OPMD patient disposition at baseline assessing:

- Rates of progression of dysphagia via quantitative radiographic measures of global swallowing function and target pharyngeal constrictor muscle function (inclusive of Videofluoroscopic Swallowing Studies (VFSS))

NH subjects roll over into Phase 1b/2a treatment study

Open-label, dose escalation study in subjects with OPMD

- **Primary endpoints:** safety and tolerability
- **Secondary endpoints:** radiographic measures of global swallowing function and pharyngeal constrictor muscle function compared to NH baseline assessments

Every 90 days, patients will be assessed for key safety and efficacy endpoints

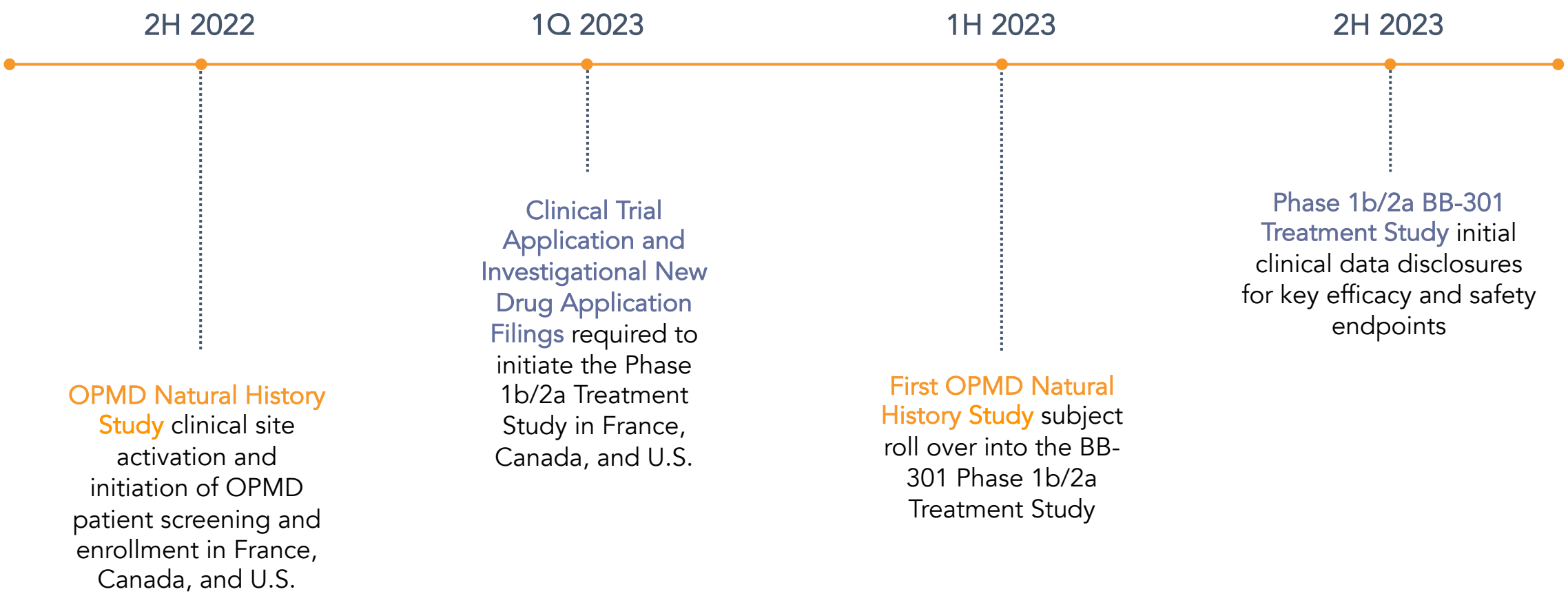
Reproducible Quantitative Radiographic Measures to Assess Baseline Natural History and Phase 1b/2a Treatment Study Endpoints

Quantitative radiographic measures of global swallowing function, pharyngeal constrictor muscle function, and swallowing efficiency using Videofluoroscopic Swallowing Studies (VFSS):

Global Swallowing Function	Pharyngeal Constrictor Muscle Function	Swallowing Efficiency
• Dynamic Imaging Grade of Swallowing Toxicity Scale (DIGEST)	• Pharyngeal Area at Maximum Constriction (PhAMPC) • Pharyngeal Constriction Ratio (PCR)	• Total Pharyngeal Residue %$(C2\text{-}4)^2$ • Vallecular Residue %$(C2\text{-}4)^2$ • Pyriform Sinus Residue %$(C2\text{-}4)^2$ • Other Pharyngeal Residue %$(C2\text{-}4)^2$ • Normalized Residue Ratio Scale ($NRRS_v$, $NRRS_p$)

Other Assessments
• Clinical measures of global swallowing capacity and oropharyngeal dysphagia • Patient-reported measures of oropharyngeal dysphagia

Upcoming Clinical and Regulatory Milestones



Broad Intellectual Property Portfolio

OPMD-related intellectual property	• OPMD Family 4 anticipated expiry February 2040 • OPMD Family 3 anticipated expiry October 2039 • OPMD Family 2 anticipated expiry December 2037 • OPMD Family 1 anticipated expiry April 2037
AAV-related intellectual property	• AAV Family 1 anticipated expiry August 2038

Financial Summary

NasdaqCM Listed: BNTC	Shares Outstanding	Cash & Cash Equivalents
• Exclusively Nasdaq listed; re-domiciled in April 2020	• 8,171,690 as of 03/31/22	• $8.6mm as of 03/31/22

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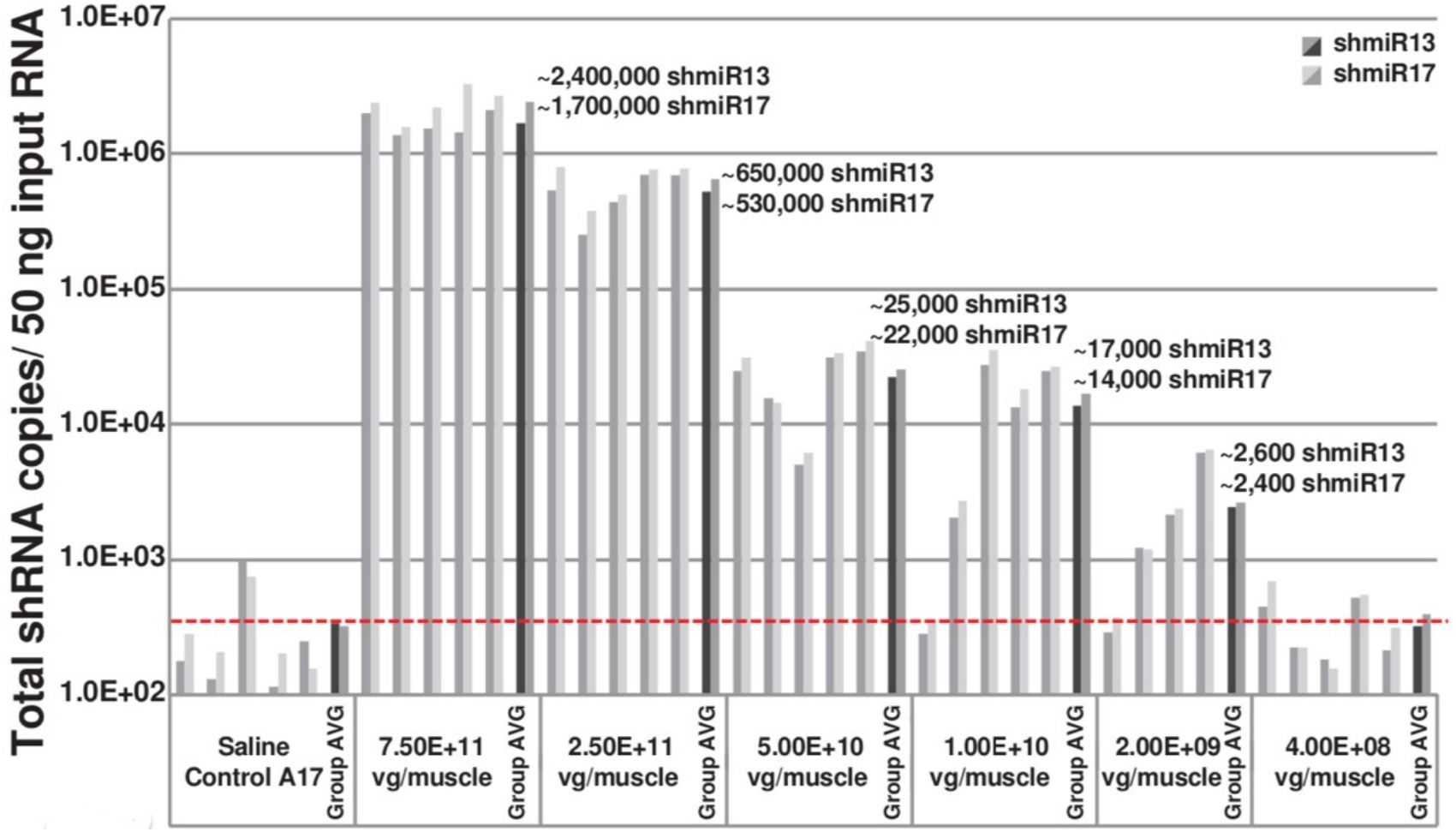
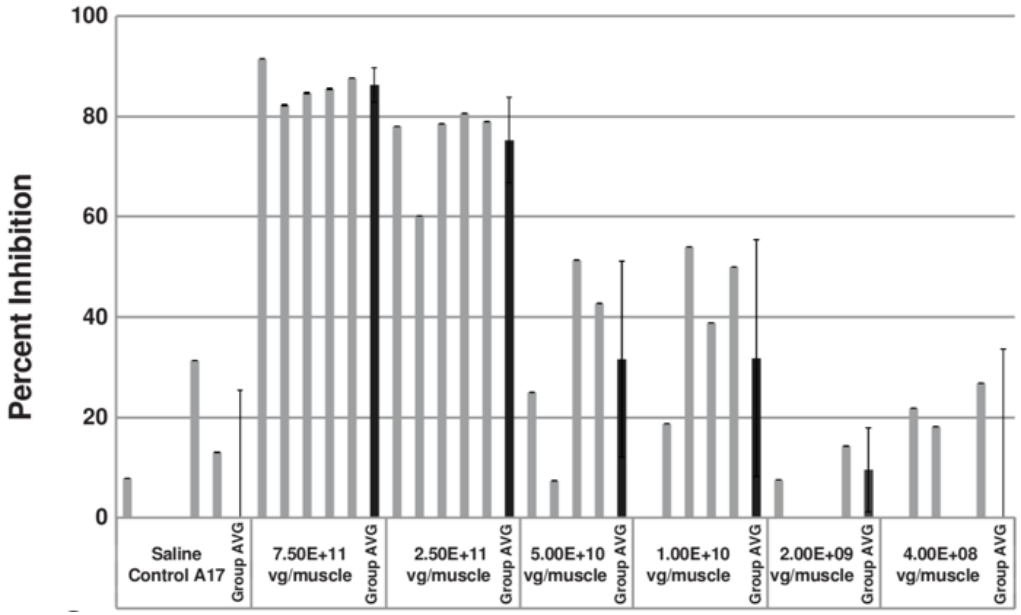
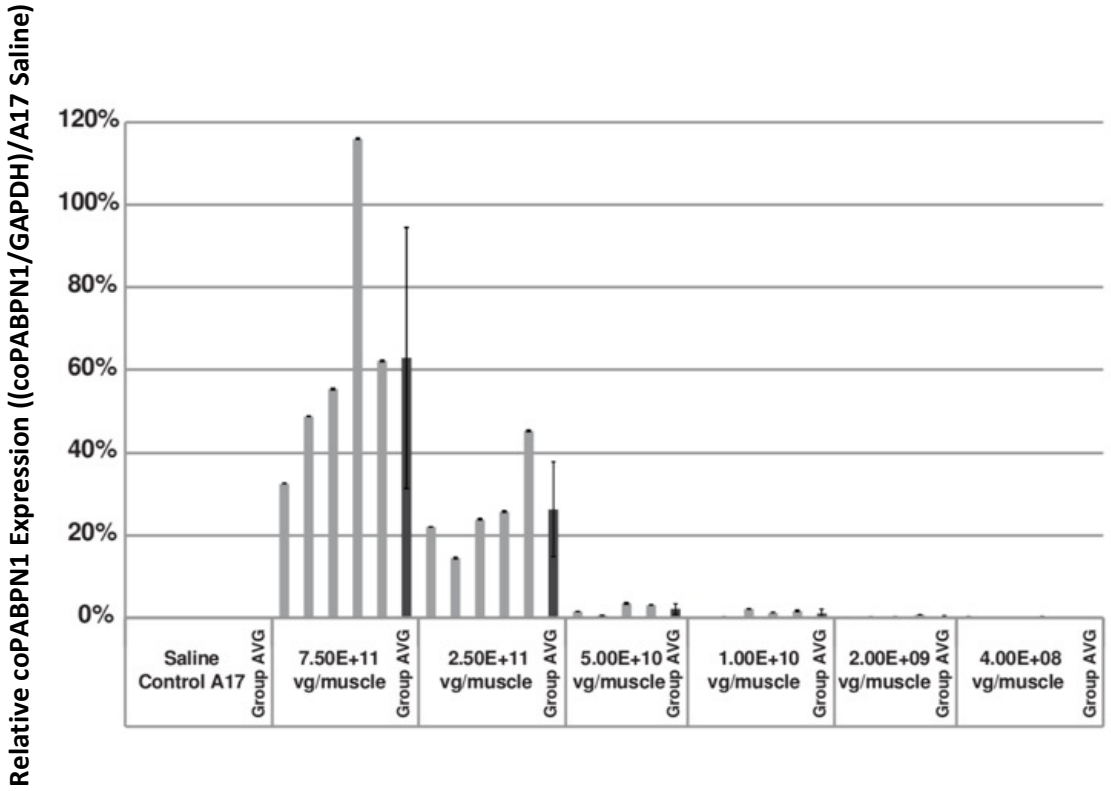
Appendix

BB-301 Drove Dose-Dependent shRNA Expression in A17 Mouse Model (Analysis Performed 14-weeks after Administration)

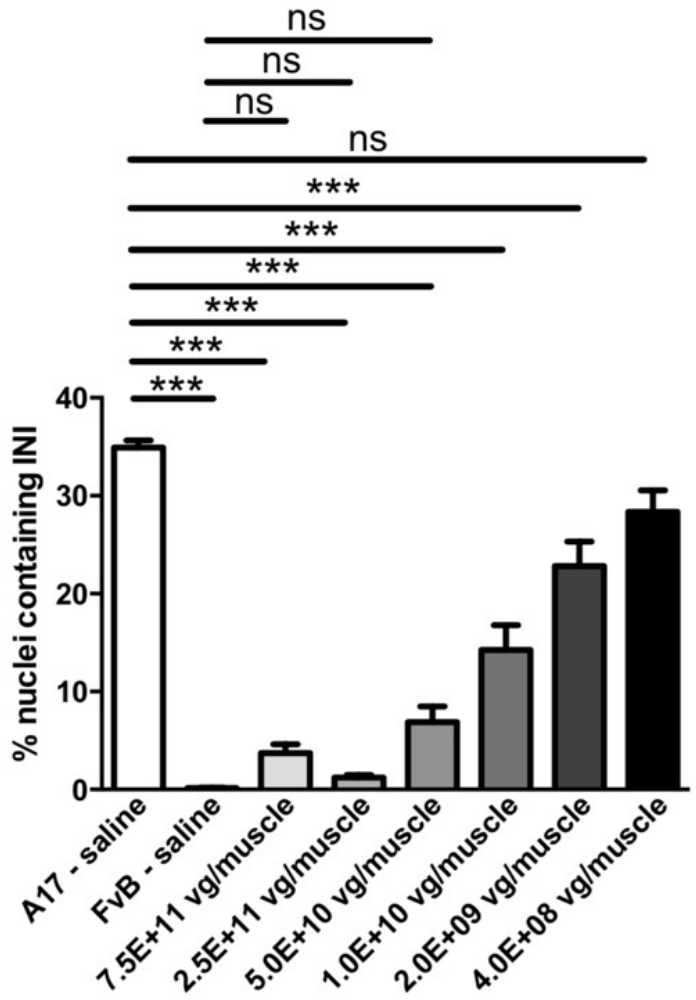


BB-301 Inhibited PABPN1 Expression and Restored Near Wild Type Levels of coPABPN1 in A17 Mouse Model (Analysis Performed 14-weeks after Administration)





BB-301 Drove Dose-Dependent Resolution of Intranuclear Inclusions in the Injected Muscles in A17 Mouse Model (Analysis Performed 14-weeks after Administration)



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THANK YOU

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