CONNECT
2017 ANNUAL CONFERENCE

Parent Project Muscular Dystrophy

WELCOME TO PPMD'S 2017 CONNECT CONFERENCE

Dear Friends,

Welcome to PPMD's Annual Connect Conference in one of my favorite cities, Chicago! We are so glad that you are able to join us this year, for what promises to be an incredible few days of research updates, care enhancements, advocacy actions, and most importantly, connecting.

The Connect Conference is unlike any other experience in our community. It is the coming together of the greatest minds fighting Duchenne, with you – the families who navigate Duchenne 24/7 and have become experts yourself. Everyone here is here because they are passionate about the fight to end Duchenne. We can all agree – we'd much rather exist in a world without this devastating disease. But until that day comes, the Connect Conference is our opportunity to unite, to lean on one another, to recharge our batteries.

The last twelve months have been extraordinary for our community. For every victory we have celebrated, we have been met almost immediately with a setback or backlash or both. But in these challenges, I think we have better defined who we are as a community, finding strength in our collective voice. This community is a force and this past year we have not only changed the landscape in Duchenne, but we have altered the entire rare disease terrain.

I hope you will take advantage of all the wonderful sessions this year's Connect Conference has to offer. And I hope you will visit the PPMD staff and find out how you can get involved this September in our community's first Duchenne Action Month. Making a difference in the fight to end Duchenne has never been more important – or more fun!

The Connect Conference isn't just about the informative sessions. Gather with us Thursday night to meet some new friends and reconnect with old pals at our Welcome Reception. Take 10 minutes out of your Friday morning and join us for our newest annual tradition, the Race to End Duchenne .1K! Throw on your cape (whether literally, metaphorically, or both!) and dance the night away at Connect Con on Saturday night. And if you need a few moments at any point while you're here, walk out the front door of this beautiful hotel and see what the great city of Chicago has to offer.

Many of you have heard me say over the years that none of us asked to be part of this community. If you're anything like me, you would have been perfectly happy never to hear the words Duchenne muscular dystrophy come from your doctor's mouth. But here we are. And because we are here together, we are stronger.

If I had to go on this journey with anyone, it is with YOU. And with YOU, we will end Duchenne.

Thank you for being here!
Warmly,

Pat Furlong
Founding President & CEO
Parent Project Muscular Dystrophy

SPECIAL EVENTS & MEET-UPS

Duchenne Teens & Adults Social

Wednesday, 6:00pm – 9:00pm • Lincolnshire Room (6th Floor)

On Wednesday evening, June 28 from 6:00pm to 9:00pm, PPMD and PPMD's Adult Advisory Committee (PAAC) will host a social for all teens and adults living with Duchenne. Join us in the Lincolnshire Room for a casual get together, light appetizers, and drinks.

Welcome Reception

Thursday, 6:15pm – 8:30pm • Salon 3 (7th Floor)

Join us on Thursday evening, June 29 for our Welcome Reception and Resource Fair and Poster Session. Meet and mingle with other conference attendees while visiting our exhibitor booths and posters. Appetizers and drinks will be provided at this reception.

Connect Con! The Connect Celebration Dinner

Saturday, 7:30pm

Join us on Saturday evening, July 1 for our Connect Celebration Dinner. This year, PPMD will host Connect Con – a lively, interactive dance party celebrating the superheroes of the Duchenne community. No costume? No worries – we will make sure there are plenty of accessory options for you at the party.

THERE'S STILL TIME TO SIGN UP FOR THESE FUN CONNECT CONFERENCE ACTIVITIES!

Kids Track

Thursday, 3:30pm – 6:00pm • Northwestern Room (6th Floor)
Friday, 9:30am – 12:30pm • Northwestern Room (6th Floor)
Saturday, 2:15pm – 5:00pm • Northwestern Room (6th Floor)

Kids Track kicks off on Thursday, June 29 at 3:30pm. Come meet some new friends and interact with old friends. Then join us for a fun show by The Magical Myster AJ!

Kids Track continues on Friday, June 30 with three age appropriate breakout groups and activities for each level. Our theme is superheroes! Lunch will be served at the end of the Kids Track morning session.

On Saturday, July 1, Kids Track meets again with additional age specific breakout groups, a movie, and other fun activities.

Registration Details:

Registration is $65 per child. Minimum age is 5 or kindergarten. If you did not register your child ahead of time, please speak to someone at Connect Conference Registration.

Kids Track registration also includes a free t-shirt, lunch on Friday, and dinner Saturday night.

Race To End Duchenne .1K

Friday, 8:00am • Salon 3 (7th Floor)

PPMD will host the Race To End Duchenne .1K on Friday, June 30 at 8:00am!

Join us for this fun and zany race as parents, families, kids of all ages, scientists and researchers, industry sponsors, and ANYONE and EVERYONE gather in Salon 3 and together tackle .1K (about the length of a football field!).

Your registration includes a race shirt, bib, swag bag, and all the fun of racing. You won't want to miss this exciting event. It's a great way to start the day, by raising awareness and having fun doing it!

Registration Details:

Registration is $20 per adult and $10 per child (kids under 5 are free). Visit the Connect Conference Registration by end of day on Thursday to secure your spot!

SEPTEMBER IS *DUCHENNE ACTION MONTH*

This September let's all do something…
To help raise awareness • To join the fight • To end Duchenne.

Mark Your Calendars...

This year, PPMD is calling on the Duchenne community to save the month of September for Duchenne Action Month!

That's right, this September will be packed full of simple and powerful actions you can take to help raise awareness and support PPMD's work in the fight to end Duchenne.

From participating in the Disneyland Half Marathon on Labor Day Weekend, to World Duchenne Awareness Day on September 7, to hosting your own event during the month, to the 10th Anniversary of Coach To Cure MD on September 30, each day of the month will feature ways you and your family can make a difference.

How to Get Involved

These are just a few of the ideas we have to help our community raise awareness this September:

» Have your child's school or your co-workers wear red to raise awareness on September 7!

» Host a Race to End Duchenne .1K sometime during the month, either in your town, at a local school, or even in your office!

» Sponsor a tailgating or watch party while your favorite Coach To Cure MD team plays on September 30!

» Ask your state governor or town mayor to recognize World Duchenne Awareness Day with a proclamation or have a landmark building "GO RED" with lighting!

Why September? Why the Whole Month?

With the growing global recognition of World Duchenne Awareness Day and the ongoing success of PPMD's Coach To Cure MD (now in its 10th year!), not to mention Congress returning to work after summer recess, our kids heading back to school and the need to reach out to teachers and administrators about Duchenne, September is the perfect month to map out a series of actions we could all take to raise awareness and funds supporting our mission to End Duchenne!

Visit ParentProjectMD.org/Month to get involved!

HOST A *RACE TO END DUCHENNE .1K*

September is Duchenne Action Month, and now is the time for you to start planning an event than can raise awareness and money, while providing people with an amazing experience that is fun and rewarding…the Race to End Duchenne .1K!

About the length of a football field (100 yards), a .1K is the race anyone can do! It requires no training and is a simple race to plan.

PPMD makes it easy for anyone to host a Race to End Duchenne .1K in virtually any space with any crowd of supporters. We provide easy access to online materials that will help you brand the event to suit your venue and your participants. And the whole thing is over in less than 15 minutes!

Here's how…

At a School
While school is out for the summer, reach out to the administration and ask them if you can plan a Race to End Duchenne .1K for September. Because it is such a short distance, kids can compete in the gym, through the cafeteria, or out on the school lawn.

And the Race to End Duchenne .1K gives you and your family an opportunity to educate the student body on life with Duchenne so that they can better understand what your child deals with every day. We'll provide age-appropriate lesson plans that can be used in classes in the week leading up to the race.

In an Office
Looking for an easy team building activity among colleagues that is simultaneously fun and meaningful? Consider an office Race to End Duchenne .1K! PPMD has lots of fun materials to help you make this brief race around your conference room and cubicles a wonderful way to raise awareness and funds to help end Duchenne.

Around Your Community
Take it outside! Host a Race to End Duchenne .1K in your community and make it a party in the streets. People have successfully hosted .1Ks on school tracks, around a neighborhood block, or from one local bar/restaurant to another. The key is to make it feel like a real race, without all the training or mileage!

Pick a date and location that works for you, and visit ParentProjectMD.org/RacePoint1K to get started planning your event!

GET IN THE GAME WITH *COACH TO CURE MD*

Over the last 9 years, Coach To Cure MD has raised $1.5 million thanks to families like yours! Every dollar you have raised has helped us advance promising research, which led to two drug approvals for Duchenne in just the last year alone.

We are less than four months away from the 10th Annual Coach To Cure MD on September 30, 2017 and YOU can help us break the $2 million mark this year to further our efforts and help us tackle Duchenne!

Join us from the moment college football kicks off through September 30, as thousands of coaches from hundreds of universities wear the Coach To Cure MD patch on their sleeve to raise awareness for Duchenne.

What started as a one-day event with a few dozen schools and less than 100 coaches participating, has become a season of raising awareness and the perfect way for you to finish Duchenne Action Month strong!

Help celebrate 10 years of Coach To Cure MD and make this the year you get in the game and help us tackle Duchenne.

Ways to Join Our Team:

Host an Event
Now is the time to start planning a viewing party, tailgate, or other simple fundraising event. PPMD will provide you with all the great tools to help you throw the best possible party. Your efforts help drive PPMD's mission forward and we need you in the game to reach the $2 million mark this year!

Attend a Game
We need families who would like to join their favorite teams on the field, to help put a face to Duchenne. Visit our website to see if a school in your area is looking for a family like yours!

Visit CoachToCureMD.org to help us tackle Duchenne!

POUND THE PAVEMENT WITH *RUN FOR OUR SONS*

Join the hundreds of friends and families that pound the pavement every year to help us end Duchenne. An amazing race may be in your own backyard!

Now recruiting for the following world class races:

- Disneyland Half Marathon Weekend
  September 1-3, 2017 | Anaheim, CA
- GoodLife Fitness Victoria Marathon
  October 8, 2017 | Victoria, British Columbia
- Baltimore Running Festival
  October 21, 2017 | Baltimore, MD
- Rock 'n' Roll Savannah Marathon & Half Marathon
  November 4-5, 2017 | Savannah, GA
- TCS New York City Marathon
  November 4, 2017 | New York, NY
- Walt Disney World Marathon Weekend
  January 3-7, 2018 | Orlando, FL
- Chevron Houston Marathon & Aramco Houston Half Marathon
  January 14, 2018 | Houston, TX
- Bank of America Shamrock Shuffle
  March 25, 2018 | Chicago, IL

Team members receive great benefits, including:

- Guaranteed entry into the race
- A pre- or post-race team party
- An official Run For Our Sons technical shirt
- A Run For Our Sons spectator t-shirt
- Personal fundraising page
- Frequent training tips

Run to make a difference. Run to raise awareness.
Run for those who can't.
Run For Our Sons.

Visit RunForOurSons.org to join a race near you!

THANK YOU TO PPMD'S RESOURCE FAIR EXHIBITORS!

The PPMD Resource Fair is an unique opportunity for resource providers and the community to connect about practical services, equipment, and more. The Resource Fair is located in Salon 3 on the 7th floor and will be open Thursday, June 29, from 6:00pm – 9:00pm, and Friday, June 30, from 8:00am – 3:00pm.

PREMIERE EXHIBITORS

KINOVA ROBOTICS

NATIONWIDE CHILDREN'S
When your child needs a hospital, everything matters.℠

STANDARD EXHIBITORS

AGADA BIOSCIENCES

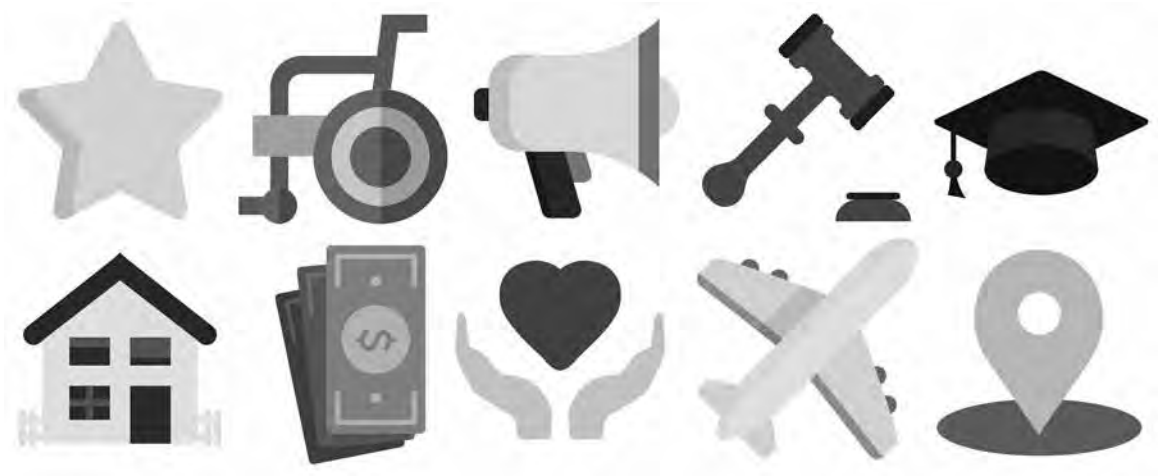
CASCADE dafo

ReveraGen BioPharma

Sherman Mobility Superstore
866-594-4000

The Assistance Fund

PPMD LAUNCHES NEW RESOURCE CENTER FOR FAMILIES



Navigating life with Duchenne can be daunting and time consuming for families. We rely on each other to share wisdom and information in order to make the process smoother. The best guidance we can get is from those who have been through a similar situation, sharing what they've learned to help others navigate resources that exist.

PPMD strives to find better ways to assist families on this their journey. With the vast amount of resources that exist online, we try to point families in the right direction, connecting them with each other and to websites online that can educate them about how to navigate through issues that impact their daily lives.

A COMMUNITY PROJECT

PPMD has launched a new resource center for families on our community site aimed at providing helpful information and links to national and state specific resources for the community tailored to guide living with Duchenne. We'd like to thank our FACES Coordinators and PPMD's Adult Advisory Committee (PAAC) members for providing initial feedback on the first phase of the resource center.

Our new resource center provides helpful links on an array of topics:

- Accessibility
- Advocacy & Disability Rights
- Education & Assistive Technology
- Health & Wellness
- Independent Living
- Insurance
- Funding Sources
- Travel & Recreation

WE NEED YOUR HELP

It is critical that YOU help to make this resource center the best it can be. We want your feedback about what is missing from the center, what may not be helpful, and ultimately for you to provide us with information about experiences you have had on your journey that should be included to help others in their journey. This should be always be a "work in progress" so that we can constantly update and evolve the site.

STATE SPECIFIC RESOURCES

One of the areas that needs your special attention is the state specific pages. You know your state better than anyone. You have knowledge about the state specific resources that have made your journey a bit easier. Please provide us with feedback on a website, agency, organization, or experience you have had navigating something within your state. Our goal is to make these state specific pages robust for families so that together we can make them a go-to location for families in your state.

Visit ParentProjectMD.org/Resources to view and add resources!

CERTIFIED DUCHENNE CARE CENTERS

People with Duchenne are being cared for by clinics both near and far. Every one of them deserves the best care and treatment possible. Parents, caregivers, patients have the right to know who is in charge of delivering the care they require and to understand what clinics meet optimal standards.

PPMD's Certified Duchenne Care Center Program helps to ensure centers maintain the highest standards in clinical and sub-specialty services, rapidly apply new evidence based knowledge, and comply with standards in clinical care that were established by the CDC Care Considerations. The goal of the program is to reduce discrepancies in care and to make comprehensive care accessible and available for all patients with Duchenne.

We have currently certified fifteen centers across the country, and plans are being made to award other qualified centers.

Provide Feedback on Your Care Center:

A very important part of care, and certification, is patient and parent input. Updating your information in PPMD's DuchenneConnect registry, and completing the Clinical Experiences Survey, will help us to continue to make sure that you/your child is receiving the best care possible. Your responses will help us to continue to sustain and improve the care and services provided to you and your family. Provide feedback at **ParentProjectMD.org/CareCenters.**

Visit ParentProjectMD.org/CareCenters to find a certified center near you.

UNDERSTANDING THE PATH TO ACCESS – RESOURCES FOR THE COMMUNITY

We have all had frustrations getting healthcare paid for, whether it is getting access and coverage for appointments, procedures, equipment, and/or medications.

Coverage is especially difficult when new medicines or procedures are recommended. Parents, patients, and medical providers spend hours putting together documents and speaking on the phone trying to convince payers that this is what is needed to keep us, our children, or our patients, as healthy as possible.

It's a complicated and overwhelming process that makes you just want to throw in the towel. But we can't. **What is important to know is that *this is a process* and policy determinations are not always final.**

To make this process easier, PPMD has assembled resources that will help families and medical providers at each stage of the healthcare access process. Included on our website at **ParentProjectMD.org/AccessResources** is a road map aimed at guiding you through this complex process – complete with sample letters and links to relevant publications and other resources.

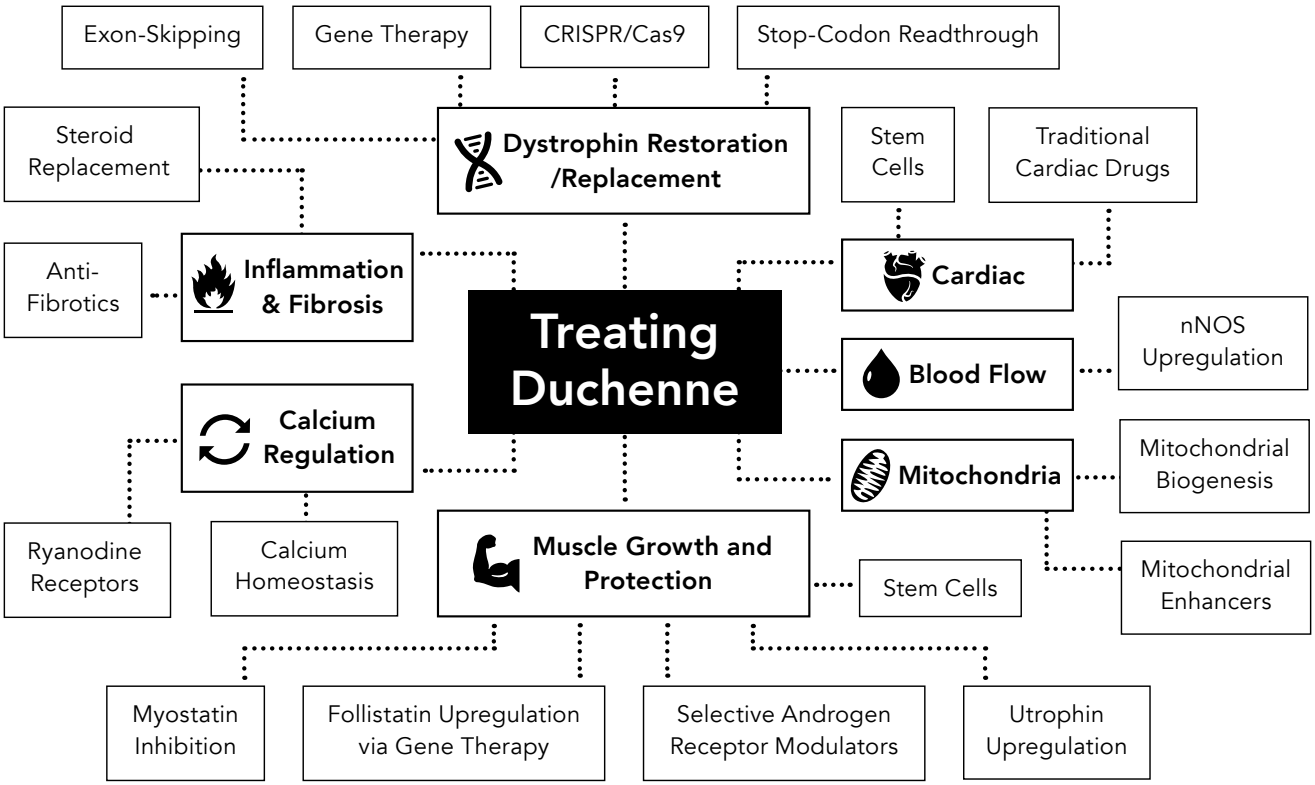
We are working closely with health insurance payers (public and private) to increase their understanding of Duchenne and how access to available and emerging interventions, therapies, and equipment can improve health outcomes for our community.

As our engagement continues and we learn more, we will update and produce additional tools and resources for utilization by our community.

Visit ParentProjectMD.org/AccessResources for important tools and information.

DUCHENNE THERAPIES IN DEVELOPMENT

Research is at the heart of advances in treatment and care for Duchenne. The chart below gives an overview of the many targets for therapeutic intervention in Duchenne—with the idea that we will ultimately treat Duchenne using a combination of therapies. PPMD is funding research in all of these areas.



Remember to register on DuchenneConnect to stay up-to-date on ALL therapies that are currently in development.

A main goal of PPMD's DuchenneConnect registry is to connect registrants with actively recruiting clinical trials and research studies. Just by joining **DuchenneConnect.org** and completing our online surveys, you are actually participating in research studies and providing data that is crucial in the fight to end Duchenne.

POTENTIAL THERAPIES INCLUDE:

Calcium Regulation

- **AT-300** [Calcium Homeostasis]
- **Carmeseal-MD™** [Calcium Homeostasis]
- **ARM210** [Calcium Homeostasis]

Cardiac

- **Aldosterone Inhibition** [Traditional Cardiac Drugs]
- **CAP-1002** [Stem Cells]
- **Coenzyme Q10 and Lisinopril** [Traditional Cardiac Drugs]

Dystrophin Restoration /Replacement

- **Eteplirsen** [Exon-Skipping]
- **Exon 2 Duplication Strategy** [Exon-Skipping]
- **Micro-dystrophin Gene Transfer** [Gene Therapy]
- **NS-065/NCNP-01** [Exon-Skipping]
- **PF-06939926 (BMB-D001)** [Gene Therapy]
- **RTC13** [Stop-Codon Readthrough]
- **SGT-001** [Gene Therapy]
- **SRP-4045 and SRP-4053** [Exon-Skipping]
- **Translarna™ (Ataluren)** [Stop-Codon Readthrough]
- **Wave Life Sciences Medications** [Exon-Skipping]

Inflammation & Fibrosis

- **CAT-1004** [Anti-fibrotics]
- **Givinostat** [Anti-fibrotics]
- **HT-100** [Anti-fibrotics]
- **NBD Peptide** [Anti-fibrotics]
- **Pamrevlumab (FG-3019)** [Anti-fibrotics]
- **Tamoxifen** [Anti-fibrotics]
- **Vamorlone (VBP15)** [Steroid Replacements]

Mitochondria

- **Epicatechin** [Mitochondrial]
- **Raxone® (Idebenone)** [Mitochondrial]
- **MTB-1** [Mitochondrial Enhancers]

Muscle Growth and Protection

- **Biglycan** [Utrophin Upregulation]
- **BMS-986089** [Myostatin Inhibition]
- **Domagrozumab (PF-06252616)** [Myostatin Inhibition]
- **DT-200** [Selective Adrogen Receptor Modulators]
- **Ezutromid (SMT C1100)** [Utrophin Upregulation]
- **Follistatin Gene Transfer** [Follistatin Upregulation]
- **iPS Cell Therapy** [Stem Cells]
- **Laminin-111** [Utrophin Upregulation]
- **Tamoxifen** [Selective Estrogen Receptor Modulators]

Register on DuchenneConnect to stay up-to-date on ALL therapies that are currently in development

A main goal of PPMD's DuchenneConnect registry is to connect registrants with actively recruiting clinical trials and research studies. Just by joining **DuchenneConnect.org** and completing our online surveys, you are actually participating in research studies and providing data that is crucial in the fight to end Duchenne. And families can turn to DuchenneConnect for helpful educational resources, empowering you with up-to-date information as you navigate your child's care.

Free genetic testing, interpretation, & counseling for people with Duchenne or Becker muscular dystrophy

If you or your child has not had genetic testing, or if their previous testing was inconclusive, they may qualify for our **Decode Duchenne Genetic Testing Program**, which provides FREE genetic testing to eligible patients. Decode Duchenne is administered by DuchenneConnect and PPMD, and is funded by Sarepta Therapeutics and PTC Therapeutics. Contact DuchenneConnect at the number below to learn more.

If you have questions about your genetic test results, please speak with your local doctor or genetic counselor. You may also contact one DuchenneConnect's board-certified genetic counselors by emailing **coordinator@duchenneconnect.org** or calling **888-520-8675**.

Parent Project
Muscular Dystrophy
LEADING THE FIGHT TO END DUCHENNE

DuchenneConnect

RESEARCH FAQ SHEETS:

The following clinical trial or research FAQ sheets are family-friendly summaries of actively recruiting clinical trials and research studies. Many are for pre-clinical research that is soon to be in clinical trial. These FAQ sheets are written for the program book of PPMD's Annual Connect Conference. We house them on **DuchenneConnect.org** as they are a useful resource for families and professionals.

NOTE: *Although we try to include the majority of studies in the United States, some companies may choose not to participate. If you have any questions about the FAQ sheets, please email* **coordinator@duchenneconnect.org**.

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Check out the glossary of terms on page 65

BMS-986089

Bristol-Myers Squibb's Investigational Candidate for Myostatin Inhibition – CN001-016

- **What stage is this research?**
  BMS-986089 is in a Phase 2/3 clinical trial in ambulatory boys with Duchenne muscular dystrophy that is currently actively recruiting.
- **What is BMS-986089?**
  BMS-986089 is an investigational protein that is designed to bind to myostatin. Myostatin is a protein produced primarily in skeletal muscle cells that prevents muscle cell growth and differentiation. Animals lacking myostatin or animals treated with substances that block the activity of myostatin have larger and stronger muscles.
- **What is the goal or purpose of this research?**
  The primary goal of the Phase 2/3 study is to determine whether this investigational drug (BMS-986089) may be a safe and effective treatment for ambulatory boys with Duchenne.
- **Is this research only being carried out in the US?**

  This research is being conducted in the United States and will soon be enrolling in Canada, along with other countries, later in 2017.

  Information regarding study sites can be found on the BMS DMD clinical trial patient and caregiver page, BMStrialDMD.com.

  There are multiple study sites open and/or planned in the following states: CA, FL, GA, IL, KS, MD, MO, NY, OH, PA, Washington DC, and Canada (locations to be confirmed).
- **Who would be eligible to participate in this clinical trial?**
  Your son may be eligible to participate if he has Duchenne confirmed by medical history with genetic testing and is:
  - » 6 to 11 years of age inclusive
  - » Able to walk without assistance and climb stairs on his own
  - » Receiving corticosteroids for 6 months (and has been on a stable dose for at least 3 months) prior to study participation
  - » Not diagnosed with kidney disease or heart failure

  Note that all Duchenne mutations are eligible.

  Full eligibility requirements for this study would be assessed at a participating study site.

  For more information, please visit clinicaltrials.gov (NCT03039686).
- **How many boys will be enrolled in the trial and will I have access to the study drug once the study has ended?**
  Approximately 159 boys with Duchenne will be enrolled in this study.

  The study consists of an initial 48-week randomized placebo-controlled phase during which all boys will receive the investigational drug (BMS-986089) or placebo (2:1 ratio, twice as many participants will receive the investigation drug compared to those that receive placebo), administered weekly by a subcutaneous (SC) injection.

  This phase will be followed by a 48-week open-label phase during which all boys will receive the investigational drug (BMS-986089).
- **Is there any funding to help pay for travel?**
  Eligible participants may receive, at no cost, transportation services with a travel concierge service to cover the costs of study-required travel.
- **Where can I learn more about this research?**
  - » Visit BMStrialDMD.com or call, 1-855-907-3286, to find a site nearest you.
  - » Or visit clinicaltrials.gov (NCT03039686).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Cardiac MRI and Genotype-Phenotype Correlations for Duchenne

Validating Cardiac MRI Biomarkers and Genotype-Phenotype Correlations for Duchenne Muscular Dystrophy

- **What stage is this research?**
  This trial is actively recruiting participants.
- **What is purpose of this study?**
  The goal of this study is to help researchers identify and validate cardiac MRI biomarkers to better understand the health of the heart and changes in heart health over time in boys with Duchenne. The study aims to identify and characterize several cardiac MRI biomarkers for boys with Duchenne and then use the well-characterized cardiac MRI biomarkers to define their sensitivity for detecting early cardiac involvement and finally to use these validated cardiac MRI biomarkers to better understand the genotype-phenotype correlation in boys with Duchenne.
- **What is the goal or purpose of this research?**
  The primary goal of the Phase 1/2 study is to assess the safety, tolerability, immunogenicity, drug levels, and drug effects of multiple doses of BMS-986089 in ambulatory boys with Duchenne.
- **Who is funding this study?**
  This study is funded by the National Institutes of Health.
- **Who is eligible to participate in this study?**
  To participate in this study you must be:
  - » Healthy boy or pediatric patient with Duchenne age 7 to 21
  - » Able and willing to complete an approximately 75 minute or less MRI exam without sedation or mechanical ventilation
  - » On a stable drug regimen (if taking prescription drugs) for at least 3 months prior to participation

  To participate in this study you may not have:
  - » Renal insufficiency
  - » Non-MRI compatible implants (e.g., neurostimulator, pacemaker, implanted cardioverter defibrillator)
  - » Claustrophobia that prevents an MRI exam
  - » Known allergy to MRI contrast agents
  - » Serum potassium level of more than 5.0 mml/L
  - » Signs and symptoms of heart failure
- **What do I have to do if I decide to participate in this study?**
  This study involves three groups.
  - » Group 1a boys are healthy volunteers who will complete a cardiac MRI without contrast.
  - » Group 1b boys are boys with Duchenne who will complete a cardiac MRI with contrast, blood tests, 24-hour heart monitoring, and pulmonary function tests.
  - » Group 2 boys are boys with Duchenne who will complete a cardiac MRI with contrast, blood tests, 24-hour heart monitoring, and pulmonary function test, then have a second MRI scan with contrast 6 months later.
  - » Group 3 boys are boys with Duchenne who will complete a cardiac MRI with contrast, blood tests, 24 hour heart monitoring, pulmonary function tests, and genetic tests.

  Special considerations: Some boys in Group 1a and 1b will have a repeat MRI scan at UCLA and at Children's Hospital of Orange County (CHOC).
- **How long will this study last?**
  Depending upon your participation in the study, you will either have one visit, or you will return to the clinic for a second cardiac MRI in 6 months. You will not receive follow up information once your participation in the study has ended.
- **Where does this study take place?**
  This study takes place at Ronald Reagan UCLA Medical Center and Children's Hospital of Orange County (CHOC).
- **How many visits to the study site are necessary?**
  Boys in Group 2 will come to the clinic for two visits. The first visit will be at the start of the study and the second visit will take place six months later.

  All other boys (Group 1b and 3) will come to the clinic for a single visit, except for ten boys (Group 1b) who will have cardiac MRI scans repeated at CHOC or UCLA, depending upon where the initial MRI scan was obtained.
- **Can any visits be done locally?**
  No, the MRI equipment requires that the cardiac MRI exams take place at UCLA or CHOC hospitals.
- **Is there any funding to help pay for travel?**
  Yes, if you are a boy in Group 3 and you live a significant distance from the study site, you may be eligible for reimbursement for travel expenses for accommodation, transportation, lodging, and meals.
- **Will I get paid for participating in this study?**
  Yes, please contact the study group for specific information.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a clinical trial, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), gaining access to the latest cardiac MRI methods before they are widely available and having access to medical specialists that may not be normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne.
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.ClinicalTrials.gov (NCT02834650).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Cardiopulmonary Function

Using MRI to Assess Cardiopulmonary Function in Duchenne

- **What stage is this research?**
  This is an actively recruiting clinical trial.
- **What is the goal or purpose of this study?**
  The purpose of this study is to monitor long term changes in heart function and breathing muscles in children with Duchenne and to develop better imaging techniques to evaluate these muscles.
- **Who is the sponsor of this study?**
  This study is sponsored by the University of Florida.
- **What are the inclusion (enrollment) criteria for this trial?**
  Participants need to be boys with Duchenne who are between the ages of 5 - 15 years old.
- **What do I have to do if I decide to participate in this study?**
  Participation includes Magnetic Resonance Imaging (MRI) of the heart and breathing muscles, breathing tests (called pulmonary function tests), exercise tests (using a stationary bike), and possibly an echocardiogram (ultrasound of the heart).
- **Where does the trial take place?**
  This study takes place at the University of Florida in Gainesville, FL.
- **Are travel expenses to the study site reimbursed?**
  Travel reimbursement is available based on the availability of charitable funding and the needs of the subject.
- **Why should I consider participating in this study?**
  Although the results from this study will not directly benefit you, the goal of this study is to learn more about the heart and breathing muscles. This information may help to develop better ways to evaluate heart and lung function in the future.
- **Where can I learn more about this study?**
  - » www.clinicaltrials.gov (code NCT02195999)
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Cough in Duchenne and Becker

Peak Cough Flow and Cough Clearance in Duchenne and Becker Muscular Dystrophy

- **What stage is this research?**
  This study is actively recruiting boys and young men with Duchenne or Becker muscular dystrophy.
- **What is the goal or purpose of this study?**
  The goal is to determine whether physiologic measures (peak cough flow, measures of respiratory muscle strength, including MIP, MEP, SNIP, and spirometry) can predict the ability to clear the airways of secretions with cough (spontaneous cough clearance, as measured by a nuclear medicine study) in children with neuromuscular disease. It will also determine whether airway clearance is augmented by high frequency chest wall oscillation.
- **Who is sponsoring this study?**
  This study is sponsored by the University of Pittsburgh and Respirtech, Inc.
- **Who is eligible to participate in this study?**
  Researchers are recruiting boys and young men with Duchenne or Becker who are between the ages of 6 years to 21 years old. Participants must not need mechanical ventilation during the day.
- **What do I have to do if I decide to participate in this study?**
  If you and your child decide to take part in this study, your child would be asked to first perform several pulmonary function tests (spirometry and measurement of respiratory muscle strength and peak cough flow). Next, subjects would inhale a radioactive "tracer" that can be seen on a special imaging camera. Your child would then be asked to cough several times over the next several minutes. Following this, they would wear a special oscillating chest vest for 30 minutes, during which they would be asked to periodically cough. The study typically lasts about 3 hours in total.
- **Where does this study take place?**
  This study is taking place at the Children's Hospital of Pittsburgh in Pittsburgh, PA.
- **Will I get paid for participating in this study?**
  Yes, families will be compensated to thank them for their time. Families will also be reimbursed for mileage costs.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a study, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), gaining access to medical specialists that are normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne.
- **Where can I learn more about this study?**
  - » For more information, please contact Paul Rebovich, MS at 412-692-5873, or paul.rebovich@chp.edu.
  - » You can learn more about this study at www.clinicaltrials.gov (NCT02034305).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Epicatechin in Duchenne

A Single Center Dose Ranging Pilot Study of (+)/- Epicatechin in Non-ambulatory Adolescents with Duchenne and Pre-symptomatic Cardiac Dysfunction

- **What stage is this research?**
  This trial is actively recruiting participants.
- **What is the goal or purpose of this study?**
  Epicatechin is a natural compound that mimics a hormone in our bodies and induces the growth of mitochondria in our cells. Mitochondria are essential for energy production in our bodies, especially in our heart, skeletal muscles, and brain. This study will determine optimal dosing for future cardiac efficacy studies. Results of secondary endpoint analysis will be used to refine design of subsequent clinical trials.
- **Who is funding this study?**
  This study is funded by the University of California – Davis and Cardero Therapeutics, Inc.
- **Who is eligible to participate in this study?**
  Participants must be males with Duchenne, ages 8-17 years old, and non-ambulatory. Additional inclusion and exclusion criteria are available on ClinicalTrials.gov (NCT02964377).
- **What do I have to do if I decide to participate in this study?**
  All participants will take oral epicatechin at various doses for 8 weeks in order to determine optimal dosing for future studies. Secondary endpoints will include biomarker assessments, cardiac functional evaluations by cardiac MRI and echocardiogram, measures of strength, range of motion and mobility, and clinical safety assessments.
- **Where does this study take place?**
  This study takes place at the University of California – Davis in Sacramento, CA.
- **How many visits to the study site are necessary?**
  5 visits
- **Is there any funding to help pay for travel?**
  No
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a clinical trial, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), gaining access to new research treatments before they are widely available and having access to medical specialists that are normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne and Becker.
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.carderorx.com and www.ClinicalTrials.gov (NCT02964377).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Genetic Modifiers

Genetic Modifiers of Duchenne and Becker Muscular Dystrophy

- **What stage is this research?**
  This study is actively recruiting participants.
- **What is the goal or purpose of this study?**
  The Genetic Modifier Study is trying to figure out what genetic changes are causing some people with Duchenne or Becker to be more mildly affected and others to be more severely affected. In other words, what genes are modifying the person's disease. Researchers will try to identify genes and gene variants that may modify the disease process and that will move the community closer to find effective treatments for Duchenne and Becker.
- **Who is funding this study?**
  This study is funded by the NIH and PPMD.
- **Who is eligible to participate in this study?**
  All males (any age) with Duchenne or Becker are eligible to participate.
- **What do I have to do if I decide to participate in this study?**
  Participation in this study requires:
  - » A brief one page questionnaire that is emailed to you, and returned by email.
  - » Blood draw or saliva collected near your home, at UCLA or at your local doctors office.
  - » A brief annual health survey (optional but helpful) by email or phone.
- **Where does this study take place?**
  This study takes place at the Center for Duchenne Muscular Dystrophy, David Geffen School of Medicine at UCLA in Los Angeles, CA.
- **Can any visits be done locally?**
  Yes. Study participants do not travel to UCLA. Participants complete all study procedures where they live.
- **Will I get paid for participating in this study?**
  No.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a study, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), and helping others by contributing to the better understanding of Duchenne and Becker.
- **Where can I learn more about this study?**
  - » You can learn more about this study at http://cdmd.ucla.edu/pages/genetic_modifiers
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

ImagingDMD

Magnetic Resonance Imaging and Biomarkers for Muscular Dystrophy

- **What stage is this research?**
  This is an active trial in Cycle 2 and enrolling.
- **What is the goal or purpose of this study?**
  This study focuses on developing Magnetic Resonance Imaging (MRI) as a tool to monitor disease progression in Duchenne and to serve as an outcome measure for clinical trials. The aim of the study is to determine whether noninvasive MRI outcome measures can replace muscle biopsies in evaluating the effectiveness of new treatments in future clinical trials.
  - » In Cycle 1 of this study, we demonstrated that MRI studies of the legs in ambulatory boys are very sensitive to disease progression, can be reliably implemented across sites, are predictive of loss of ambulation, and correlate with function. This is extremely important as it provides strong evidence that MRI can be valuable as a biomarker in clinical trials.
  - » In Cycle 2 of this study, we will perform MRI studies of the arms and study the effect of loss of ambulation on the MRI biomarkers. The reason for studying the arms and MRI biomarkers in boys that lose the ability to walk is to set the stage for the inclusion of non-ambulatory boys in future clinical trials.
- **Who is funding this study?**
  This study is funded by the NIH – NIAMS/NINDS.
- **Who is eligible to participate in this study?**
  - » Cycle 1: Enrollment is complete.
  - » Cycle 2: Participants in this study will be males with Duchenne, ages 5-18 years ambulatory and non-ambulatory upon entering the study.
- **What are participants doing in this study?**
  Phase 2: MRI and Magnetic Resonance Spectroscopy (MRS) measurements are performed on the participants' arm as well as leg muscles, muscle strength, and functional tests such as performance of the upper limb, timed tests, and walking (if ambulatory) are also performed. Additionally, blood, urine, and saliva samples will be taken from the participants and stored in established tissue banks.
- **Where does this study take place?**
  This study is taking place in three different cities in the US: Gainesville, FL at the University of Florida; Philadelphia, PA at Children's Hospital of Philadelphia (CHOP); and Portland, OR at the Oregon Health and Science University (OHSU) and Shiners Hospital for Children-Portland.
- **When will the study be completed?**
  The estimated study completion date is May 2020.
- **Are there any preliminary results available?**
  Preliminary results (Cycle 1) are available through www.ClinicalTrials.gov and the PubMed database www.ncbi.nlm.nih.gov
- **Where can I learn more about these studies?**
  Contact study coordinator:
  - » Claudia Senesac
    352-273-6453
    csenesac@phhp.ufl.edu
  - » You can learn more about this study at www.ImagingDMD.org and www.ClinicalTrials.gov (NCT01484678).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Imaging of Dystrophic Muscle

Magnetic Resonance and Optical Imaging of Dystrophic and Damaged Muscle

- **What stage is this research?**
  This study is actively recruiting participants for enrollment.
- **What is the goal or purpose of this study?**
  This study focuses on the concurrent development of Optical Imaging (OI) and Magnetic Resonance Imaging and Spectroscopy (MRI and MRS) as tools to detect and quantify muscle damage, potentially to serve as an outcome measures for clinical trials. The overall aim of this study is to validate the potential of noninvasive OI and MR techniques to assess the state of health in muscle.
- **Who is funding this study?**
  This study is funded by the Department of Defense (DOD).
- **Who is eligible to participate in this study?**
  To participate in this study you must be a healthy adult male, or an individual affected by Duchenne.
  - » Healthy adult males must be between 18-50 years of age that do not participate in sport specific training greater than twice a week.
  - » Individuals affected by Duchenne must be males between 10-15 years of age.

  All subjects must be able undergo an MRI scan, and be able to comply during testing.
- **What do I have to do if I decide to participate in this study?**
  Healthy adult males will undergo forearm exercise training in both arms, followed two days later by image collection (OI, MRI, and MRS). Additionally, a small amount of blood will be drawn from these subjects.

  Individuals affected by Duchenne will not undergo any exercise training and only undergo imaging (OI, MRI, MRS).
- **How long will this study last?**
  This study is expected to last to September 2017.
- **Where does this study take place?**
  This study takes place at the University of Florida, in Gainesville, FL.
- **How many visits to the study site are necessary?**
  Healthy adult males will participate in two visits to the site, 48 hours apart. The first visit will be the exercise testing day, and the second visit will be the MRI and Optical Imaging day.

  Individuals affected by Duchenne will participate in one visit to the site and will only undergo imaging.
- **Can any visits be done locally?**
  No, all visits must be completed at the University of Florida.
- **Is there any funding to help pay for travel?**
  Yes, the participant and one parent/legal guardian will be reimbursed for travel expenses and meals during your participation in this study.
- **Will I get paid for participating in this study?**
  Yes, you will receive a gift card after each visit is completed.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a clinical trial, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), and helping others by contributing to the better understanding of Duchenne. Optical Imaging scans in this study will provide an image of arm muscle blood flow, tissue perfusion, and test for damaged muscle. These images, in combination with MRI images, will be used to evaluate acute muscle damage resulting from the exercises done in the arm muscles. These images will provide clinically useful information for the detection and monitoring of damaged muscle. Through comparing information from your muscles to that of people with diseases of muscles, we will learn about the muscle changes associated with Duchenne. Also, we hope to develop an inexpensive and mobile device to assess the quality and health of muscle, which may benefit future clinical trials and studies of muscular diseases. This highly portable and flexible device could be extended to subjects who are wheelchair bound or not able to lie still in the MRI machine.
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.ClinicalTrials.gov (NCT#: NCT02168114).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Microsoft Band

Use of Microsoft Bands as an Outcome Measure in Boys with Duchenne Muscular Dystrophy

- **What stage is this research?**
  This study is actively recruiting boys with Duchenne muscular dystrophy.
- **What is the goal or purpose of this study?**
  Researchers want to learn what functional activities can be measured while boys with Duchenne wear the Microsoft (MS) Band, a fitness tracking device.
- **Who is sponsoring this study?**
  This study has received sponsorship from Clark Construction, the Foundation to Eradicate Duchenne (FED) and ReveraGen BioPharma. The University of Pittsburgh and the Cooperative International Neuromuscular Research Group (CINRG) are involved with study planning and implementation.
- **Who is eligible to participate in this study?**
  Researchers are recruiting boys with Duchenne, ages 4 years – 17 years old. Participants must have reliable access to wireless internet.
- **What do I have to do if I decide to participate in this study?**
  If you and your child decide to take part in this study, your child would be asked to wear the MS Band for seven straight days (10 hours per day and while sleeping). You would then take a break for a week, and following this break, your child would wear the MS Band for another seven straight days. During this time, you would be asked to complete daily logs about your child's activity and ensure the MS Band is plugged in and the battery fully charged each night. You will be asked questions about your child's daily routines and family experiences with the MS Band. Six months after your initial wearing period, you will be asked to complete these activities for a third period of seven straight days.
- **Where does this study take place?**
  This study is coordinated from the CINRG network site: the University of Pittsburgh in Pittsburgh, PA.
- **Will I get paid for participating in this study?**
  Yes, families who take part will be compensated to thank them for their time.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a study, there are other benefits, including allowing you to play an active role in your own healthcare (or that of your child), gaining access to medical specialists that are normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne.
- **Where can I learn more about this study?**
  - » For more information, please contact Annmarie Kelleher at 412-383-5045 or akelleher@pitt.edu.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Microsoft Band (Sleep Efficiency)

Sleep Efficiency in Boys with Duchenne Muscular Dystrophy and Their Caregivers

- **What stage is this research?**
  This study is actively recruiting boys with Duchenne muscular dystrophy and their caregiver(s)/parent(s).
- **What is the goal or purpose of this study?**
  Researchers want to explore relationships between daily activity and sleep quality in boys with Duchenne muscular dystrophy, as well as sleep quality of caregivers.
- **Who is sponsoring this study?**
  This study has received sponsorship from the Foundation to Eradicate Duchenne (FED). The University of Pittsburgh and the Cooperative International Neuromuscular Research Group (CINRG) are involved with study planning and implementation.
- **Who is eligible to participate in this study?**
  Researchers are recruiting boys with Duchenne, ages 4 years – 10 years old. Participants must have reliable access to wireless internet.
- **What do I have to do if I decide to participate in this study?**
  If you and your child decide to take part in this study, your child would be asked to wear the MS Band for 30 straight days (10 hours per day and while sleeping), and you will be asked to wear the MS Band while sleeping. During this time, you would be asked to complete questionnaires about your child's activity and ensure the MS Bands are charged and synced each day. You will be asked questions about your child's daily routines and family experiences with the MS Band.
- **Where does this study take place?**
  This study will be coordinated from the CINRG network site: the University of Pittsburgh in Pittsburgh, PA.
- **Will I get paid for participating in this study?**
  Yes, families who take part will be compensated to thank them for their time.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a study, there are other benefits, including allowing you to play an active role in your own healthcare (or that of your child), gaining access to medical specialists that are normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne.
- **Where can I learn more about this study?**
  - » For more information, please contact Annmarie Kelleher at 412-383-5045 or akelleher@pitt.edu.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Microsoft Band (Vamorolone extension)

Microsoft Bands as an Outcome Measure - Parallel Study to Clinical Study Protocol VBP15-003 (Vamorolone extension)

- **What stage is this research?**
  This study is actively recruiting boys with Duchenne muscular dystrophy.
- **What is the goal or purpose of this study?**
  Researchers want to explore the use of the Microsoft (MS) Band as an outcome measure to detect change in daily activity patterns during the course of a clinical trial.
- **Who is sponsoring this study?**
  This study has received sponsorship from the Foundation to Eradicate Duchenne (FED) and ReveraGen BioPharma. The University of Pittsburgh and the Cooperative International Neuromuscular Research Group (CINRG) are involved with study planning and implementation.
- **Who is eligible to participate in this study?**
  Researchers are recruiting boys with Duchenne, ages 4 years – 7 years old, enrolled in the VBP15 (Vamorolone) 2a extension study. Participants must have reliable access to wireless internet.
- **What do I have to do if I decide to participate in this study?**
  If you and your child decide to take part in this study, your child would be asked to wear the MS Band for the entire 2a extension trial (24-weeks/6 months for 10 hours per day) on their non-dominant wrist. During this time, you would be asked to complete weekly questionnaires about your child's activity. The MS Band and provided phone must be plugged in and charged each night. You will be asked questions about your child's daily routines and family experiences with the MS Band. Additionally, your child will be asked to wear the MS Band during their clinical assessments.
- **Where does this study take place?**
  This study is coordinated from the CINRG network site: the University of Pittsburgh in Pittsburgh, PA.
- **Will I get paid for participating in this study?**
  Yes, families who take part will be compensated to thank them for their time.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a study, there are other benefits, including allowing you to play an active role in your own healthcare (or that of your child), gaining access to medical specialists that are normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne.
- **Where can I learn more about this study?**
  - » For more information, please contact Annmarie Kelleher at 412-383-5045 or akelleher@pitt.edu.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Noninvasive Cardiac & Pulmonary Imaging

UF Wellstone: Failed Regeneration in the Muscular Dystrophies — Inflammation, Fibrosis, and Fat

- **What stage is this research?**
  This trial is actively recruiting participants.
- **What is the goal or purpose of this study?**
  The goal of this study is to develop novel, noninvasive magnetic resonance imaging (MRI) biomarkers to monitor disease progression in the heart and respiratory muscles and to investigate how these biomarkers are related to genetic modifiers in Duchenne muscular dystrophy.
- **Who is funding this study?**
  This study is funded by the NIH.
- **Who is eligible to participate in this study?**
  To participate in this study you must be between 5-18 years with a confirmed diagnosis of Duchenne. You must also be able to lie flat on your back for the MRI.
- **What do I have to do if I decide to participate in this study?**
  This study involves approximately 1 -1.5 hours of MRIs of the heart, chest, and abdominal muscles. Participants also complete noninvasive respiratory tests (such as forced vital capacity).
- **Where does this study take place?**
  This study takes place at the University of Florida (UF) in Gainesville, FL.
- **How many visits to the study site are necessary?**
  Participants come to UF for 5 visits over the course of 5 years (1 visit/year).
- **Is there any funding to help pay for travel?**
  Yes. The study pays for the cost of airfare and hotel for the participant and one parent/legal guardian.
- **Will I get paid for participating in this study?**
  There is a gift card provided to the participants after each visit is completed.
- **Where can I learn more about this study?**
  - » Please email Dr. Glenn Walter at UF at glennw@ufl.edu.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

NS-065/NCNP-01 for Exon 53 Skipping

Safety and Dose Finding Study of NS-065/NCNP-01 in Boys with Duchenne

- **What stage is this research?**
  Study NS-065/NCNP-01-201 is a Phase 2 study that is recruiting participants at clinical sites in North America (United States and Canada).
- **What is the goal or purpose of this study?**
  This study is being conducted to evaluate the safety and tolerability of a low dose and high dose of NS-065/NCNP-01 injection delivered as a weekly intravenous infusion in patients with Duchenne who are amenable to exon 53 skipping. NS-065/NCNP-01 is a new drug designed to skip exon 53 in the dystrophin gene. Additional objectives of the study will assess its effect on induction of dystrophin, muscle function and strength, pharmacokinetics, and pharmacodynamics.
- **Who is funding this study?**
  The study is sponsored by NS Pharma, Inc.
- **Who is eligible to participate in this study?**
  Approximately 16 boys with Duchenne will be enrolled. The main eligibility criteria are:
  - » Boys between the ages of 4 and less than 10 years old;
  - » Confirmed Duchenne diagnosis with a specific change in the dystrophin gene that is amenable to skipping of exon 53;
  - » Able to walk independently without assistive devices;
  - » Able to complete the time to stand, time to run walk and time to climb assessments;
  - » Currently on a stable dose of glucocorticoid steroids for at least 3 months
- **Will all boys enrolled in this trial receive treatment with the investigational therapy?**
  This study is a 2-period, randomized, placebo-controlled, dose finding study for 24 weeks.
  - » Period 1 is a 4-week, blinded, placebo-controlled phase. This means that neither you nor your study doctor will know if your son is receiving the study medication or an inactive solution (placebo).
  - » Period 2 is a 20-week, open-label phase. This means that all participants receive the study medication.

  The escalation to the high dose will occur once all participants have completed the first period of 4 weeks in the low dose and safety of the low dose is confirmed.
- **What do I have to do if I decide to participate in this study?**
  The Principal Investigator (study doctor) will review study requirements with all participants during the screening process.
  - » Participants enrolled in this study will receive weekly infusions of NS-065/NCNP-01 or placebo for the first 4 weeks. Then all participants will receive weekly infusions of NS-065/NCNP-01 for the following 20 weeks.
  - » Participants will have study visits for safety laboratory tests, muscle function and strength testing, and other safety monitoring such as adverse event collection. Participants will also have two muscle biopsies, of the bicep muscle, during the study.
- **How long will this study last, and will I have access to the drug/treatment once the study has ended?**
  This study will last up to 28 weeks (weekly infusion for 24 weeks). Participants completing the study will be eligible for a separate 24-week open-label extension study.
- **Why is Study NS-065/NCNP-01-201 including a placebo group of participants?**
  During the initial 4 weeks (Period 1), participants are randomized to receive NS-065/NCNP-01 or placebo. Participants in the placebo arm serve as a control arm to participants in the NS-065/NCNP-01 arm. The safety information collected during Period 1 will be compared between the placebo and NS-065/NCNP-01 groups to help evaluate the safety of NS-065/NCNP-01.
- **Where does this study take place?**
  This study is conducted at selected participating centers of the Cooperative International Neuromuscular Research Group (CINRG) in North America. For more information on site locations, please visit www.clinicaltrials.gov. Identifier NCT02740972
- **Will I get paid for participating in this study?**
  Reimbursement is available for travel expenses and meals for study visits. Support and travel arrangements are made by Greenphire, a travel agency specializing in clinical research travel arrangements.
- **Why should I consider participating in this study?**
  There are no guarantees that participating in this research will benefit you or your son. But, by participating you and your son can:
  - » Help to advance research on the safety and effectiveness of NS-065/NCNP-01
  - » Help researchers to better understand exon skipping in Duchenne
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.ClinicalTrials.gov (NCT# NCT02740972).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Pamrevlumab

An Investigational Therapeutic Monoclonal Antibody to inhibit the activity of Connective Tissue Growth Factor (CTGF)

- **What stage is this research?**
  This trial is actively recruiting participants.
- **What is the goal or purpose of this study?**
  This is a Phase 2, open-label, single arm trial of pamrevlumab (FG-3019) to estimate its efficacy in non-ambulatory patients with Duchenne muscular dystrophy. The rationale for using pamrevlumab in patients with Duchenne is based on data that show that CTGF promotes muscle fibrosis and reduces the ability of damaged muscle cells to repair. Pamrevlumab binds to CTGF and may prevent this cascade. In a preclinical study using an mdx mouse model, pamrevlumab reduced muscle fibrosis and improved muscle function. These data suggest that treatment with pamrevlumab may slow the loss of muscle function. The use of pamrevlumab is investigational in this study. Pamrevlumab is not an FDA-approved drug for any indication and its efficacy and safety have not been demonstrated yet.
- **Who is sponsoring this study?**
  This study is sponsored by FibroGen, Inc., a clinical stage biopharmaceutical company (www.fibrogen.com).
- **Who is eligible to participate in this study?**
  To participate in this study you must be age 12 years or older with Duchenne, and non-ambulatory (wheelchair dependent). Please see ClinicalTrials.gov (NCT 02606136) for additional inclusion and exclusion criteria.
- **What do I have to do if I decide to participate in this study?**
  Each eligible participant will receive pamrevlumab every two weeks by intravenous infusion for 52 weeks with the possibility to add an additional 26 weeks of treatment with prior FibroGen medical monitor approval. All participants will be closely monitored for safety. Efficacy assessments will be performed routinely over 54 weeks and up to 80 weeks (for participants that qualify for additional treatment); pulmonary and muscle function tests approximately every 3 months, MRIs approximately once a year. This study also includes collection of quality of life data in a questionnaire.
- **How long will this study last?**
  The anticipated length of the study is approximately 52 weeks with the possibility to add an additional 26 weeks of treatment for up to a total of 78 weeks with FibroGen medical monitor approval.
- **Where does this study take place?**
  This study is open at several sites across the United States: Cincinnati Children's in Cincinnati, OH; Washington University in St. Louis, MO; UCSF Benioff Children's Hospital in San Francisco, CA; Children's Hospital Colorado in Aurora, CO; University of Iowa in Iowa City, IA; Children's Hospital of Philadelphia in Philadelphia, PA; Children's Hospital Boston in Boston, MA; Shriner's Hospital for Children in Portland, OR; University of California, Los Angeles in Los Angeles, CA; Children's Medical Center Dallas in Dallas, TX.

  Please refer to the study listing on ClinicalTrials.gov (www.clinicaltrials.gov (NCT02606136)) for the most current list of open sites.
- **How many visits to the study site are necessary?**
  Approximately 34 visits over 56 weeks and up to 47 visits over 82 weeks with FibroGen medical monitor approval.
- **Can any visits be done locally?**
  No, all study visits must be conducted at the participating clinical center.
- **Is there any funding to help pay for travel?**
  Yes, participants are eligible for reimbursement for some costs related to travel to/from study visits or overnight lodging. The travel reimbursement program for this study is being facilitated by NORD (National Organization for Rare Diseases) and information is available from each site's study coordinator.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a clinical trial, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), gaining access to new investigational research treatments, having access to medical specialists that may not normally be available to you or your child, and helping others by contributing to the better understanding of Duchenne. While we do not yet know if there is any clinical benefit of pamrevlumab in Duchenne patients, it is possible that pamrevlumab treatment may slow the loss of muscle function.
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.fibrogen.com and www.clinicaltrials.gov (NCT02606136).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

RAXONE®

Phase 3 Study Assessing the Efficacy, Safety and Tolerability of Idebenone in Patients with Duchenne Muscular Dystrophy Receiving Glucocorticoid Steroids (SIDEROS)

- **What stage is this research?**
  This is a new Phase 3 trial which began recruiting participants in September 2016.
- **What is the goal or purpose of this study?**
  The primary objective of this study is to assess the efficacy and safety of Raxone® in slowing the loss of pulmonary function in boys with Duchenne receiving glucocorticoid steroids. In a previous Phase 3 study (DELOS), idebenone was shown to slow the loss of respiratory function in boys with Duchenne not taking concomitant glucocorticoid steroids.
- **What is Raxone® and how does it work?**
  Raxone® is the brand name for Santhera's 150 mg film-coated idebenone tablets. Idebenone works in Duchenne to increase the energy output of the cells' mitochondria – the parts ("factories") of the cell that generate all of a cells' energy. Specifically, the drug acts as an electron carrier to provide additional electrons to the mitochondria, which use them to generate energy. Idebenone can carry and drop off electrons within the mitochondria numerous times. In addition to helping cells make extra energy, idebenone is a powerful antioxidant and can neutralize destructive free radicals in cells. All of these activities help dystrophic muscle cells to maintain their cellular energy supply, which is reduced as a result of the lack of dystrophin and protect cells from oxidative stress.
- **Who is funding this study?**
  This study is funded by Santhera Pharmaceuticals.
- **Who is eligible to participate in this study?**
  To participate in this study, you must be male with Duchenne, at least 10 years old and have stable use of glucocorticoid steroids continuously for at least 12 months with no dose adjustments for the past six months, with the exception of weight changes. This includes prednisone or deflazacort, and any dosing regimens. Changes between prednisone and deflazacort are allowed if dose is comparable.

  Participants must have a baseline Forced Vital Capacity between 30%-80% and be able to provide reliable and reproducible pulmonary function testing.
- **What do I have to do if I decide to participate in this study?**
  This study involves a screening assessment, and boys will be randomized to receive either 900 mg/daily of idebenone (2 tablets, 3 times daily with food) or placebo for 18 months. Parents will be asked to keep a daily diary of medication intake.

  Participants will complete safety assessments, pulse-oximetry, and pulmonary function tests at study site visits every three months, as well as be given a hand-held spirometry device to complete weekly pulmonary function assessments at home.

  Funding will be provided to assist families with costs to participate in the study.
- **How long will this study last, and will I have access to the drug/treatment once the study has ended?**
  Patients' active participation is up to 21-22 months (88-92 weeks) including screening and follow-up visits, and 18 months receiving study medication or placebo.

  Patients completing the study through week 78 will be eligible to participate in an open-label extension study and will continue to receive medication until the trial is terminated or Raxone is approved.
- **Where can I learn more about this study?**
  - » Please visit www.siderosdmd.com for updates on this trial.
  - » Information about the trial is also available at www.DuchenneConnect.org and www.clinicaltrials.gov.

Skeletal and Cardiac Impairment in Carriers

Characterization of Clinical Skeletal and Cardiac Impairment in Carriers of Duchenne and Becker

- **What stage is this research?**
  This is an actively recruiting longitudinal observational clinical study.
- **What is the goal or purpose of this study?**
  To study the neuromuscular, cardiovascular, and psychological/cognitive impact of being a genetic carrier of Duchenne or Becker muscular dystrophy.
- **Who is the sponsor of this study?**
  This study is sponsored by Parent Project Muscular Dystrophy.
- **What are the inclusion (enrollment) criteria for this study?**
  - » 18 years of age and older
  - » Able to complete testing in English
  - » A genetically confirmed mutation in the Duchenne gene with an affected son

  OR
  - » Duchenne/Becker mothers with NO somatic mutation in the Duchenne gene (females who are not carriers of Duchenne/Becker but have an affected son)

  OR
  - » Healthy females (who are not carriers of Duchenne/Becker) with a normal CK level
- **What do I have to do if I decide to participate in this study?**
  The study consists of three visits which take place on an annual basis. Each visit spans the course of one to two days and includes a number of procedures that address the neuromuscular, cardiovascular, psychological, and cognitive impact that you may experience. If you are interested in taking part in this study, please contact the study coordinator at Nationwide Children's Hospital to find out more about what's involved and decide if you would like to schedule a study visit.
- **Where does the study take place?**
  This study takes place at Nationwide Children's Hospital in Columbus, Ohio.
- **Are travel expenses to the study site reimbursed?**
  The study is currently able to provide up to $500 in reimbursement for travel and lodging expenses. Please contact the study coordinator for additional information about reimbursement.
- **Why should I consider participating in this study?**
  While a primary benefit of the study is in understanding the impact of being a genetic carrier of Duchenne or Becker, the study also provides and pays for several tests such as an MRI and Cardiovascular Stress test which may be of value to you or your physician.
- **Where can I learn more about this study?**
  Contact study coordinator:
  - » Dan Jenkins
    614-355-2602
    Daniel.jenkins@nationwidechildrens.org
    www.clinicaltrials.gov (NCT02972580)
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet

VAMOROLONE

A Potential Steroid Alternative Customized for Duchenne

- **What stage is this research?**
  This Phase 2a clinical trial (VBP15-002/VBP15-003) is actively recruiting boys with Duchenne muscular dystrophy.
- **What is the goal or purpose of this research study?**
  The goal of this research is to see if vamorolone can be safely and effectively used for the treatment of Duchenne. Vamorolone is hoped to retain the beneficial anti-inflammatory and muscle strengthening aspects of corticosteroids (prednisone, deflazacort), while decreasing some of the undesirable side effects (bone fragility, stunted growth, insulin resistance). Vamorolone has additional activities such as a mineralocorticoid receptor antagonism and membrane stabilization that may increase benefit to boys with Duchenne.
- **Who is funding this research study?**
  The study sponsor ReveraGen has received funding from the National Institutes of Health - National Institute of Neurological Disorders and Stroke to carry out the Phase 2a and Phase 2a extension study (1R44NS095423-01). The National Institutes of Health - National Institute of Arthritis and Musculoskeletal and Skin Diseases funded the planning stages of the Phase 2a and extension studies (1U34AR068616-01).
  - » To date, ReveraGen has worked through public-private partnerships to develop other aspects of the vamorolone development program:
  - » The European Commission is funding the Phase 2b study through Europe (667078 - VISION DMD – RIA).
  - » PPMD ($750,000) and Foundation to Eradicate Duchenne ($250,000) are co-funding the chronic toxicology studies.
  - » The $2.1M Phase 1 trial was funded by MDA (50%), and three UK foundations (Joining Jack, Duchenne Research Fund, Duchenne Children's Trust).
  - » Additional funding has provided by the Save Our Sons, NIH TRND, CDMRP Department of Defense, CureDuchenne, and the Duchenne Alliance Research Foundation (Save Our Sons, Michael's Cause, Pietro's Fight, Alex's Wish and Ryan's Quest).
- **Who is eligible to participate in this research study?**
  The Phase 2a clinical trial has begun will enroll approximately 48 boys with Duchenne who have never taken steroids for Duchenne and who are ages 4, 5, or 6 at study entry.
- **How long will this research study last, and will I have access to the investigational drug once the study has ended?**
  The Phase 2a study will include an extension study. Those who opt to enter the Phase 2a and Phase 2a extension study will have a 2 week drug treatment, 2+ week drug tapering period, and then 6-month extension study on drug. An additional 2-year extension study is also available.
- **Where does this research study take place?**
  The Phase 2a clinical trials in boys with Duchenne will take place at sites of the Cooperative International Neuromuscular Research Group (CINRG) network in the USA, Canada, Australia, Sweden, United Kingdom, and Sweden.
- **How many visits to the study site are necessary?**
  Phase IIa = approximately 6 visits over 1-2 months; Phase 2a extension = approximately 9 visits
- **Can any visits be done locally?**
  Visits must be done at one of the participating CINRG sites.
- **Will I get paid for participating in this research study?**
  Travel expenses are paid for by the study.
- **Why should I consider participating in this research study?**
  Participation will help determine whether vamorolone is an effective therapy for Duchenne. Showing effectiveness for Duchenne could have implications for many other disorders where steroids are used. The vamorolone program includes many innovations in clinical trial design that, if successful, will speed other drug development programs, including blood biomarkers and mobile health outcomes (Microsoft Band).
- **Where can I learn more about this research study?**
  - » Information will be posted on the ReveraGen website, as well as www.clinicaltrials.gov.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.
  - » Contact Andrea Smith at asmith@trinds.com

ATALUREN

A Phase 3 Randomized Double Blind Placebo Controlled Efficacy and Safety Study of Ataluren in Patients with Nonsense Mutation Duchenne Muscular Dystrophy (nmDMD) and Open Label Extension

- **What stage is this research?**
  Recruitment is anticipated to begin in June 2017.
- **What is the goal or purpose of this study?**
  The goal is to study the long-term safety and efficacy effects of ataluren in patients with nmDMD.
- **Who is funding this study?**
  This study is funded by PTC Therapeutics.
- **Who is eligible to participate in this study?**
  To participate in this study you must be:
  - » Male with Duchenne, age ≥5 years
  - » Nonsense point mutation in the dystrophin gene
  - » Use of systemic corticosteroids (prednisone/prednisolone or deflazacort) for a minimum of 12 months immediately prior to start of study treatment, with no significant change in dosage or dosing regimen for a minimum of 3 months immediately prior to start of study treatment
  - » Ability to perform 6MWD ≥150 meters
  - » Ability to perform timed function tests within 30 seconds
  - » Willingness and ability to comply with scheduled visits, drug administration plan, study procedures, laboratory tests, and study restrictions.
- **What do I have to do if I decide to participate in this study?**
  This study involves clinic visits every 12 weeks during the double-blind period and every 24 weeks during the open-label period.
- **How long will this study last, and will I have access to the drug/treatment once the study has ended?**
  The anticipated length of the study is 72-week of double-blind, placebo controlled and 72-week open-label period.
- **Where does this study take place?**
  This study will be conducted internationally with sites around the world.
- **How many visits to the study site are necessary?**
  Approximately 11 visits over the 144 week duration of the study.
- **Can any visits be done locally?**
  No, visits to the study site will be required to ensure consistency.
- **Is there any funding to help pay for travel?**
  Reimbursement will be determined on a case-by-case basis.
- **Will I get paid for participating in this study?**
  No, there is no payment for study participants.
- **Why should I consider participating in this study?**
  While no personal benefit can ever be guaranteed by participation in a clinical trial, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), gaining access to new research treatments before they are widely available and having access to medical specialists that are normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne.
- **Where can I learn more about this study?**
  You can learn more about this study at www.ClinicalTrials.gov (NCT# not assigned at time of printing).
  Please check www.DuchenneConnect.org for updates to this FAQ sheet.

GIVINOSTAT (ITF2357)

A Histone Deacetylase (HDAC) Inhibitor for the Treatment of Duchenne

- **What stage is this research?**
  A Phase 2 open label clinical trial in boys with Duchenne is ongoing in Italy. Twenty ambulant boys with Duchenne aged 7 to <11 years at study start and on stable corticosteroid treatment were enrolled and treated for ≥ 36 months with Givinostat. Results after one year of treatment are described below. This clinical trial was conducted to evaluate whether the beneficial histological effects observed with Givinostat in the mdx mouse could be extended to boys with Duchenne.

  A Phase 3 double blind, placebo controlled trial, in the ambulant Duchenne boys from 6 years of age, is ready to start in the USA, Canada, and Europe. The first site in Europe has already opened, while in USA the first site will be opened by June 2017.

- **Where is this research being done and who is funding this research?**
  Givinostat is being developed by Italfarmaco SpA. The Phase 2 open label study was conducted with the contribution of the European Community through the Endostem project.

- **What is the goal or purpose of this research?**
  Givinostat, an investigational drug, is a HDAC inhibitor that has the potential to benefit all Duchenne patients regardless of their dystrophin mutation.

  HDAC activity is upregulated in dystrophic muscles. This hyperactivity contributes to the impairment of muscle regeneration. HDAC inhibitors stimulate myogenesis in vitro and counter muscle degeneration in mdx mice, promoting the transcription of a number of factors that are key in muscle regeneration such as follistatin. Givinostat has also a potent anti-inflammatory effects. The combination of Givinostat effects is expected to re-balance the repair process in Duchenne muscle towards an increased muscle regeneration and a reduced fatty infiltration and fibrosis.

  The main purpose of the upcoming Phase 3 trial is to determine that Givinostat is able to slow the disease progression in Duchenne children. The study will also assess safety and tolerability of the drug.

- **What is the current state of this research?**
  Preclinical studies in the mdx mouse model of Duchenne have shown that an oral Givinostat dose dependently produced functional and morphological beneficial effects, such as:
  - » increased muscle weight,
  - » increased cross sectional area of myofibers,
  - » decreased inflammatory infiltrate, and fatty replacement,
  - » prevention of fibrotic scars,
  - » increased membrane stability, and
  - » increased performance in the treadmill test.

  Clinical results from a Phase 2 clinical trial in ambulant Duchenne boys aged between 7 and < 11 years old showed that Givinostat significantly counteracted histological disease progression after 12 months of treatment, in particular:
  - » It significantly increased muscle fibers size, and it significantly decreased total fibrosis, fatty replacement, necrosis, the mean number of hypercontracted fibers;
  - » It significantly increased regenerative fibers with no depletion of the pool of satellite cells.

  The functional tests showed an overall stability after 12 months of treatment in this population, with small changes in some parameters. Overall the drug was safe and well tolerated. The study is still ongoing; 18 boys started the fourth year of treatment in July 2016. The results of this Phase 2 study, 12 months of treatment were published in Neuromuscular Disorders, in October 2016 (Bettica et al, 26(10):643-649).

- **Where will future trials take place? Will there be study sites in the US?**
  The next clinical trial is a Phase 3 trial in ambulant Duchenne boys and will take place in European and Canadian sites and in about 15 sites in the US. Please check www.ClinicalTrials.gov for details regarding the trial sites.

- **Who would be eligible to participate in a clinical trial?**
  Ambulant Duchenne boys from 6 years of age. Participants must be on stable corticosteroid for at least 6 months prior to start the treatment and able to perform the 4-stairs climb in not more than 8 seconds. Additional details regarding inclusion and exclusion criteria will be available on www.ClinicalTrials.gov (NCT#02851797)

- **Where can I learn more about Givinostat?**
  - » You can learn more about Givinostat at www.italfarmaco.com
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

TAMOXIFEN

Using Tamoxifen to Improve Muscle Strength in Duchenne Muscular Dystrophy

- **What stage is this research?**
  This research in Duchenne is currently at the transition from pre-clinical to clinical, meaning that pre-clinical data and previous experience with this drug are sufficient to start a clinical trial involving patients. Tamoxifen is the generic name for an approved drug (Nolvadex, Tamifen) that is used to treat estrogen-dependent breast cancer.

  Although it is possible that there will be an improvement in muscle strength in humans, we do not know for sure yet.

- **Where is this research being done and who is funding this research?**
  This research has been initiated at Dr. Urs Ruegg's laboratory at the University of Geneva, Switzerland and is conducted by his collaborators, mainly Dr. Olivier Dorchies. It continues at Dr. Leonardo Scapozza's laboratory. They have shown that tamoxifen triggers substantial improvements in muscle quality and strength in mdx mice. Among others, Parent Project Muscular Dystrophy has been helping to fund this research.

  For details, see: Dorchies OM, Reutenauer-Patte J, Dahmane E, Ismael H, Petermann O, Patthey-Vuadens O, Comyn S, Gay E, Piacenza T, Handa RJ, Décosterd LA, and Ruegg UT: The anticancer drug tamoxifen counteracts the pathology in a mouse model of DMD. Am J Pathol. 182, 485-504 (2013).

  Additional data, still unpublished, support the beneficial actions of tamoxifen on the mouse model of Duchenne.

- **What is the goal or purpose of this research?**
  The main goal is to initiate a clinical trial of tamoxifen in Duchenne patients based on convincing pre-clinical data. These showed that low doses (threshold 0.3 mg/kg body weight per day) were effective to improve muscular function in mdx mice.

- **What is the current state of this research?**
  Drs. Ruegg and Dorchies have tested various doses of tamoxifen in both young and old mice. Benefits of treatment included lower creatine kinase levels, 40% less fibrosis (scarring) in diaphragm and heart than in untreated mice, and near normal improvements in muscle strength. Although mice are not humans and it is never entirely certain how results will translate, a robust treatment response in mice that lack dystrophin is the gold standard for moving drugs into human clinical trials for Duchenne.

  The laboratory of Dr. Dominic Wells at the University of London has shown that the results from Drs. Ruegg and Dorchies can be reproduced readily and that the combination of tamoxifen plus prednisolone gives a slightly stronger effect than any of the two drugs alone.

  Starting in October 2015, Dr. Talya Dor from the Hadassah Medical Center in Jerusalem has given tamoxifen at doses of 10 and 20 mg per day to three Duchenne boys. All patients showed an initial improvement in strength, which stabilized after a few months and stayed stable since then. One boy showed an improved 6-minute walk test, and another one showed an improved 4-stair up score compared with his entry score. Creatine kinase levels were reduced mildly in two patients and dramatically in one, and no significant adverse effects were noted. Parents of all boys reported higher energy and less fatigue, that were sustained throughout the 18-months treatment period. Based on these findings with compassionate off-label treatment with tamoxifen, Dr. Dor has started a formal clinical trial in Israel with boys aged 6-16 years to be treated for one year with a potential for extension to 3 years.

- **What steps need to be completed before moving into a clinical trial?**
  While pre-clinical data are encouraging, we don't yet know if tamoxifen will have the same beneficial effects in Duchenne patients.

  Noteworthy, the pharmacological profile of tamoxifen is well known; it has also been given to children aged 5 to 12 to treat hormone-dependent disorders, and no adverse effects have been reported. A proposal for a clinical trial in Duchenne boys was accepted in 2016 by the European Union E-Rare program termed "Clinical research for new therapeutic uses of already existing molecules (repurposing) in rare diseases":http://www.erare.eu/all-funded-projects. This trial is also funded by several patient organizations (Duchenne UK, Duchenne Parent Project-NL, and Monaco Muscular Dystrophy Association).

  A 48-week randomised, double-blind, placebo-controlled clinical trial with about 100 ambulant (6.5-10 year old) Duchenne patients under stable standard treatment of care with glucocorticoids is foreseen.

  A presentation followed by a discussion with the experts of the TREAT-NMD TACT committee (http://www.treat-nmd.eu) took place in late April 2017; feedback is expected in June 2017.

- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  The trial will start in September 2017, provided that ethical and regulatory permissions are in place.

- **Where would a clinical trial take place?**
  The trial will be conducted in around ten centers in Europe. The Principal Investigator is Professor Dirk Fischer at the University Hospital in Basel, Switzerland.

(Continued on p.36)

(Continued from p.35)

- **Who would be eligible to participate in a clinical trial?**
  The inclusion criteria will be boys with Duchenne of age 6-12 years that are under stable standard treatment of care with glucocorticoids.
- **Where can I learn more about this research?**
  - » Details of this clinical trial will be posted on www.ClinicalTrials.gov once it is ready to be initiated.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

ARM210

Using ARM210 to Improve Muscle Strength and Function in Duchenne Muscular Dystrophy

- **What stage is this research?**
  This research in Duchenne muscular dystrophy is in Phase 1 clinical stage, meaning a first time in human clinical safety study in adult healthy volunteers is underway.
- **Where is this research being done and who is funding this research?**
  This research is being done by ARMGO® Pharma, Inc. The Muscular Dystrophy Association awarded the company $1 million to develop the compound, ARM210, for treatment of Duchenne.
- **What is the goal or purpose of this research?**
  ARMGO® has identified a new class of small molecule therapeutics (called Rycals®) that restore normal balance of calcium within muscle cells by correcting the activity of a type of channel called the "ryanodine receptor calcium channel complex" (RyR). In mice that lack dystrophin, Rycal® ARM210 corrected a calcium leak occurring through the RyR and improved daily activity, strength, muscle force and muscle damage. These studies help establish the rationale for conducting a clinical trial with this compound in Duchenne.
- **What is the current state of this research and what steps need to be completed before moving into a clinical trial?**
  Formal non-clinical toxicology studies required by the FDA have been completed. ARM210 was found to be safe and well tolerated. A first time in human Phase 1 clinical safety study in adult healthy volunteers began at the end of 2015, and is expected to complete this year.
- **What is your best estimate for the length of time it will take to move this research into clinical trials in Duchenne patients?**
  Following successful completion of a Phase 1 clinical safety study in adult healthy volunteers and discussions with clinical experts and regulators, an initial clinical study in Duchenne patients is planned to start in early 2018.
- **Where would a clinical trial take place?**
  It is too early to know where a clinical trial for this research would be located. Many complex factors go into determining the right location(s) for a clinical trial.
- **Who would be eligible to participate in a clinical trial?**
  Again, it is too early to know what the inclusion criteria would be for a future clinical trial.
- **Where can I learn more about this research?**
  - » You can learn more about ARM210 at ARMGO's website (http://www.armgo.com/).
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

AT-300

Akashi's Novel Modulator of Stretch-Activated Calcium Channels

- **What stage is this research?**
  This compound is in preclinical research, meaning it has not yet advanced to clinical trials.
- **What is the goal or purpose of this research?**
  The objectives of this preclinical research program were to identify the optimal dosing level and regimen for use in a future clinical study and provide essential proof of concept data of efficacy in Duchenne. The research compound, AT-300, is a novel modulator of stretch-activated calcium channels. It is intended to help restore normal levels of calcium in Duchenne skeletal and cardiac muscle. Abnormally high levels of calcium in Duchenne muscle contribute to loss of function and eventually to muscle cell death. AT-300 would be relevant for all boys and young men with Duchenne, regardless of mutation. The results of these studies were extremely successful, showing significant protection from muscle strength loss after exercise.

  Akashi Therapeutics is conducting this research and has received Orphan Drug status for AT-300 for Duchenne.
- **Who is funding this research?**
  The drug is being developed for Duchenne by Akashi Therapeutics, Inc.
- **What steps need to be completed before moving into a clinical trial?**
  We need to explore long term efficacy of this drug and conduct a series of preclinical safety studies to establish preliminary safety before filing for an IND and conducting a study in humans, most likely in healthy volunteers.
- **What is your best estimate of when AT-300 could enter a clinical trial?**
  The initial clinical study, a safety study that would most likely be conducted in healthy volunteers, will likely begin in 2018.
- **Where can I learn more about this research?**
  - » You can learn more at www.akashirx.com (http://akashirx.com/)
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Carmeseal-MD™

Poloxamer 188 NF

- **What stage is this research?**
  In the US: Our research is at the clinical stage, our product has an open IND and approval for an initial clinical trial.

  In Europe: While we are developing Carmeseal-MD in the US under FDA supervision, it is already available to patients in Europe, Argentina, and New Zealand as an unlicensed medicinal product ("Special") when prescribed by a specialist.

- **Where is this research being done and who is funding this research?**
  Phrixus studies were supported financially by the SMARTT (Science Moving towards Research Translation and Therapy) program at NHLBI. Technical work is being conducted at SRI International. Our work to date has been funded by the National Institutes of Health (NIH) through SBIR grants, the Biosciences Research and Commercialization Center, as well as Coalition Duchenne and Duchenne Alliance.

- **What is the goal or purpose of this research?**
  Our goal is to demonstrate that Carmeseal-MD has beneficial effects in patients with both Duchenne and Becker muscular dystrophy: An improvement in cardiac and respiratory function via protection of heart muscle and diaphragm, as well as an improvement in upper body strength. Carmeseal-MD acts as a molecular band-aid by binding to and then sealing microscopic tears in muscle cells caused by the lack of functional dystrophin. This prevents the uncontrolled leakage of calcium which in turn increases the performance of heart muscle and diaphragm and prevents their degeneration.

- **What is the current state of this research?**
  Carmeseal-MD has been shown to be effective in three dystrophic animal models (mdx and mdx/utr double-knock out mice, GRMD dogs) and two models of heart failure (rats with surgically induced heart failure, micro-embolism induced dog heart failure model). All pre-clinical studies are complete and we are starting to collect data from our first patients. Specifically, we have not observed any adverse events, however, data from biomarkers is favorable (such as a 60% reduction in CPK).

- **What steps need to be completed before moving into a clinical trial?**
  We need to raise approximately $1 million to conduct P-004, a 10-patient open label trial at Cincinnati Children's Hospital with Dr. John Lynn Jefferies as Principal Investigator. All regulatory activities have been completed.

- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  3-6 months after further funding.

- **Where would a clinical trial take place?**
  We are already collaborating with leading research clinicians and have verbal commitments from several to conduct the first trials. High likelihood centers include Cincinnati Childrens Hospital (John Jefferies, supported our pre-IND meeting), and the University of Tennessee Health Science Center (Jeff Towbin, also supported our pre-IND meeting).

- **Who would be eligible to participate in a clinical trial?**
  Carmeseal-MD is expected to be useful for all patients with Duchenne or Becker, regardless of genetic mutation. We expect enrollment of non-ambulatory patients with early cardiac and respiratory dysfunction. This approach maximizes our chances of seeing a positive effect and provides a clinical trial opportunity for patients who cannot perform the 6-minute walk test.

- **Where can I learn more about this research?**
  - » Please visit www.phrixuspharmaceuticals.com/index.htm.
  - » Updates to this FAQ sheet will be posted on www.DuchenneConnect.org.

DT-200

A Selective Androgen Receptor Modulator to Improve Muscle Strength & Function in Duchenne

- **What stage is this research?**
  The DT-200 development program has completed three Phase 1 trials in 78 healthy adult volunteers. These studies showed that the SARM is safe and well tolerated for up to 14 days of treatment. Testing in Duchenne has not yet begun.
- **Where is this research being done and who is funding this research?**
  DT-200 is wholly owned by Akashi Therapeutics, who is leading the clinical development program. Akashi is currently seeking funding for the next development step, a 4-week Proof of Concept (POC) clinical trial.
- **What is the goal or purpose of this research?**
  DT-200 is a selective androgen receptor modulator (SARM). Selective androgen receptor modulators (SARMs) have been developed to mimic the muscle building effects of androgens (testosterone), without their undesirable side effects. Akashi hopes that the more precise action of this drug will confer better long term safety and tolerability in both adult and pediatric muscle diseases compared to androgens. DT-200 is effective in multiple animal models, including mice that lack dystrophin. Importantly, compared to other SARMs in clinical development, DT-200 shows significantly greater preference for skeletal muscle. Accordingly, Akashi plans to develop DT-200 with the objective of improving muscle strength and function in both adult neuromuscular disease, such as Charcot Marie Tooth disease (CMT) and Facioscapulohumeral Muscular Dystrophy (FSHD), and in pediatric neuromuscular diseases such as Duchenne and Spinal Muscle Atrophy (SMA).
- **What is the current state of this research and what steps need to be completed before moving into a clinical trial?**
  Three Phase 1 studies with DT-200 were successfully completed in Belgium and Germany, having confirmed the product is safe and well tolerated at the once daily oral dose of 0.5 mg. Akashi met with the UK Regulatory Agency (MHRA) for scientific advice and input into the design of a Proof of Concept clinical trial and has received ethical approval for a 4-week POC trial in the UK in healthy adult volunteers. The main objective of the POC trial is first to evaluate DT-200's ability to increase mass, strength, and function of healthy muscle. It is anticipated the POC trial will take approximately 9 months to complete. All initial formulation development and testing work has been completed to allow start of this study in 2nd half of 2017.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  If the POC trial in healthy adult subjects is positive, Akashi anticipates initiation of clinical trials in Duchenne muscular dystrophy within 12 months from the conclusion of the POC trial.
- **Where would a clinical trial take place?**
  Phase 2 trials would be initiated in both the US and Europe.
- **Who would be eligible to participate in a clinical trial?**
  It is too early to know what the inclusion criteria would be for a future clinical trial. This drug could be beneficial for all Duchenne boys regardless of specific mutation.
- **Where can I learn more about this research?**
  You can learn more about DT-200 (and other Akashi initiatives) by consulting the Akashi website at:
  - » http://akashirx.com
  - » www.ClinicalTrials.gov will post all DT-200 clinical trials once they are actively recruiting subjects.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Exon 2 Skipping for IRES Activation

Exon 2 Skipping Therapy to Induce Internal Ribosomal Entry Site (IRES) Activation in Duchenne Patients with Exon 2 Duplications

- **What stage is this research?**
  This research is pre-clinical, meaning it has not advanced to clinical trials involving people yet.
- **What steps need to be completed before moving into a clinical trial?**
  Completion of IND-enabling in-life toxicity studies in mice (now underway).
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  9 months.
- **What is the goal or purpose of this study?**
  - The goal of this study is to induce skipping of either one of both copies of exon 2 in patients with exon 2 duplications.
  - We intended to induce exon skipping by the use of a virus carrying several copies of a modified small nuclear RNA (U7snRNA) targeted to exon 2, where it interferes with splicing.
  - Skipping of one copy of exon 2 will be expected to result in a wild-type Duchenne transcript and expression of a full-length dystrophin protein. Skipping of both copies of exon 2 will be expected to result in the activation of an IRES in exon 5 that results in the production of a highly functional version of the dystrophin protein.
- **Who is funding this study?**
  The preclinical development of this study has been funded by CureDuchenne. Funding for the clinical trial has not yet been obtained.
- **Who will be eligible to participate in this study?**
  The final enrollment criteria are not set, but we anticipate enrolling ambulate patients who carry a duplication of exon 2.
- **What do I have to do if I decide to participate in this study?**
  - This study will involve frequent visits to Nationwide Children's Hospital.
  - Delivery of the vector will likely require sedation and delivery to both legs via a catheter.
  - Muscle biopsies before and 12 weeks after vector delivery will be required.
- **How long will this study last, and will I have access to the drug/treatment once the study has ended?**
  - The study will require follow up for two years after injection.
  - Patients who participate in the trial are unlikely to be eligible for later gene delivery with the same vector, due to the expected development of antibodies to the viral capsid. However, animal studies suggest that genes delivered by AAV viruses will last for years.
  - If the treatment were to be approved by the FDA, plasmapheresis to clear anti-AAV antibodies may allow future treatment, although this cannot be guaranteed at present.
- **Why should I consider participating in this study?**
  - Patients who naturally express the IRES-driven isoform of the dystrophin protein walk in to their seventh decade.
  - Studies in an animal model of exon 2 duplication Duchenne show that skipping can be done very efficiently with the virus.
- **Where can I learn more about this study?**
  - You will be able to learn more about this study at www.DuchenneConnect.org and www.ClinicalTrials.gov, and www.nationwidechildrens.org/center-for-gene-therapy.

iPS Cell Therapy

iPS Cells and Therapeutic Applications for Duchenne

- **What stage is this research?**
  We had a Pre-IND meeting with the FDA in late March, and if everything goes well with our manufacturing and pre-clinical studies, we will be in the position for IND filling in the very near future.

- **Where is this research being done and who is funding this research?**
  This research is being done in the lab of Dr. Rita Perlingeiro at the University of Minnesota, in partnership with the University of Minnesota Center for Translational Medicine and the Molecular and Cellular Therapeutics Facility. Seed funding has been kindly provided by the Greg Marzolf Jr Foundation. A grant submitted to the Department of Defense (DoD) has been recently recommended for funding.

- **What is the goal or purpose of this research?**
  - » Induced pluripotent stem cells (iPS) are adult cells that have been reprogrammed to an embryonic stem cell-like state.
  - » There has been tremendous excitement for the therapeutic potential of iPS cells in treating genetic diseases. Our current research builds on our successful proof-of-principle studies for Duchenne performed with mouse wild-type and dystrophic iPS cells as well as control (healthy) human iPS cells. These studies demonstrate equivalent functional myogenic engraftment to that observed with their embryonic counterparts following their transplantation into dystrophic mice.
  - » Our goal now is to apply this technology to clinical grade GMP-compliant iPS cells, and generate a cell product, iPS-derived myogenic progenitors, that can be delivered to muscular dystrophy patients.

- **What steps need to be completed before moving into a clinical trial?**
  Optimization of methodology, characterization of cell product, scalability with GMP-compliant method, followed by safety and efficacy studies. Once these have been achieved, we will be ready to move into a clinical trial.

- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  2-3 years (it depends largely on how much funding we have available to conduct these studies).

- **Where would a clinical trial take place?**
  University of Minnesota

- **Who would be eligible to participate in a clinical trial?**
  In the first phase, adults with confirmed diagnosis of Duchenne (> 18 years old).

- **Where can I learn more about this research?**
  - » You can learn more about this research at the website for Dr. Perlingeiro's lab: www.med.umn.edu/lhi/research/PerlingeiroLab/index.htm
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.duchenneconnect.org for updates to this FAQ sheet.

MTB-1

MTB-1 Mediated Gene Regulation

- **What stage is this research?**
  We are expecting to file an IND in May and First-in-Human Phase 1 study in normal healthy adult volunteers is anticipated for summer 2017.
- **Where is this research being done and who is funding this research?**
  The pre-clinical research was performed and funded by Mitobridge and Astellas Pharma will conduct and fund the clinical development.
- **What is the goal or purpose of this research?**
  The goal of the Phase 1 study is to demonstrate safety and tolerability in normal healthy adult volunteers. The study will also characterize concentration and biological effects of varied doses of MTB-1 in order to pave the way for future studies in Duchenne patients.
- **What is the current state of this research?**
  Our pre-clinical data demonstrate that MTB-1 can improve mitochondrial function and have relevant, beneficial effects in pre-clinical models of Duchenne, including mdx mice and muscle cells from patients with Duchenne.
- **What steps need to be completed before moving into a clinical trial?**
  The IND needs to be filed with the FDA. The first Duchenne patient trial is anticipated for second half of 2018.
- **Where would a clinical trial take place?**
  The first clinical trial will be conducted at a single study site in the US. The sites for the Duchenne patient studies have not yet been determined.
- **Who would be eligible to participate in a clinical trial?**
  Normal healthy adult volunteers will participate in the First-in-Human PI study. The mechanism of action of MTB-1 is not dependent on a particular dystrophin mutation and therefore Duchenne patients with all mutation types could be included in subsequent clinical trials.
- **Where can I learn more about this research?**
  - » www.mitobridge.com
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

NBD Peptide

Using NF-κB Blockers to Decrease Inflammation and Improve Muscle Function in Duchenne

- **What stage is this research?**
  This research in Duchenne is pre-clinical, meaning it has not advanced to clinical trials involving people with Duchenne yet.
- **Where is this research being done and who is funding this research?**
  This research is being done in Dr. Denis Guttridge's laboratory at The Ohio State University in collaboration with colleagues at The Ohio State University and Nationwide Children's Hospital. The work was funded by the NINDS branch of the NIH.
- **What is the goal or purpose of this research?**
  The NF-κB pathway has been shown to be involved in promoting inflammation and compromising muscle function in response to the loss of dystrophin in Duchenne. Dr. Guttridge's group has used a small molecule called "NBD" to specifically block this pathway. In mice that lack dystrophin, NBD significantly improves the function of breathing muscles and allowed the mice to maintain whole body function. In addition, skeletal muscle limb function was also improved when NBD was administered to dogs lacking dystrophin. Furthermore, in mice that lack dystrophin and utrophin, the drug significantly improved cardiac function.
- **What is the current state of this research and what steps need to be completed before moving into a clinical trial?**
  - » Discussions have taken place with the FDA in order to submit a pre-Investigational New Drug application.
  - » Formal Non-GLP toxicology studies have been performed. GLP pharmacology toxicology studies are planned.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  Preparations are in place to complete the final studies leading to an IND submission.
- **Where would a clinical trial take place?**
  The Phase 1 safety trial is planned for Nationwide Children's Hospital, Columbus Ohio, directed by Dr. Jerry Mendell. For Phase 2, it is too early to know where a clinical trial will take place and much will depend on the safety profile determined in Phase 1.
- **Who would be eligible to participate in a clinical trial?**
  Beyond the Phase 1 safety study, it is too early to know what the inclusion criteria would be for a future clinical trial.
- **Where can I learn more about this research?**
  - » You can learn more about Dr. Guttridge's research at The Ohio State University website (https://medicine.osu.edu/regenerativemedicine/therapies)
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

PF-06939926 (formerly BMB-D001)

Mini-Dystrophin Gene Therapy for Duchenne Muscular Dystrophy

- **What stage is this research?**
  This research is pre-clinical, meaning it has not advanced to clinical trials involving people yet.
- **Where is this research being done and who is funding this research?**
  This research is being conducted and sponsored by Pfizer Inc., following Pfizer's acquisition of Bamboo Therapeutics in August, 2016. Pfizer's Rare Disease Research Unit is located in Cambridge, Massachusetts and is expanding their gene therapy manufacturing capabilities in Chapel Hill, North Carolina.
- **What is the goal or purpose of this research?**
  The clinical candidate, PF-06939926, consists of a recombinant AAV vector expressing a miniaturized version of the Duchenne gene, which encodes the domains minimally required for functionality of the dystrophin protein. Pfizer plans to conduct a Phase 1/2 trial to test the safety and gather preliminary efficacy data after delivery of PF-06939926 in boys with Duchenne.
- **What is the current state of this research?**
  Pfizer and Bamboo are jointly continuing to generate preclinical data in rodent and canine models with the intent to submit an Investigational New Drug (IND) application to the FDA for a Phase I/2 trial.
- **What steps need to be completed before moving into a clinical trial?**
  The FDA will need to review the IND application and allow the trial to move forward.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  A Phase 1/2 clinical trial is planned to begin at the beginning of 2018.
- **Where would a clinical trial take place?**
  Many complex factors go into determining the right location(s) for a clinical trial. The clinical trial sites have not yet been determined for the Phase 1/2 trial. Discussions are on-going.
- **Who would be eligible to participate in a clinical trial?**
  It is too early to know what the inclusion criteria would be for a future clinical trial. Inclusion and exclusion criteria are being determined now.
- **Where can I learn more about this research?**
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.
  - » Visit Pfizer.com/pipeline, Pfizer's online database where you learn more about our portfolio of new medicines and find more about our Research and Development efforts around the world.

Recombinant Human Laminin-111

Recombinant Human Laminin-111 (rhLAM-111) is a protein replacement therapy for LAM-211 deficiency - congenital muscular dystrophy type 1A (MDC1A)

- **What stage is this research?**
  This research is pre-clinical, we are developing our manufacturing capability but we have not yet advanced to clinical trials.
- **Where is this research being done and who is funding this research?**
  LAM-111 research is performed at the University of Nevada, Reno and Prothelia Inc. in Massachusetts among other laboratories in the US, Canada, and EU

  Prothelia's funding has been primarily through NIH grants and advocacy groups including PPMD's End Duchenne GAP program, Struggle Against Muscular Dystrophy (SAM), and Hope for Gus.
- **What is the goal or purpose of this research?**
  Our primary goal is production of rhLAM-111 for IND enabling studies and Phase 1 clinical trials.

  We continue to generate new animal efficacy data in MDC1A and Duchenne animal models.
- **What is the current state of this research?**
  This project is in preclinical development and we have demonstrated effectiveness in the mdx and dyW mouse models of Duchenne and MDC1A, respectively. Current efforts are focused on MDC1A and positive clinical data for MDC1A may accelerate clinical development for Duchenne.

  The mechanism of action of rhLAM-111 in Duchenne is through 1] direct stimulation of satellite cells and muscle regeneration and 2] upregulation (increased expression) of the Duchenne modifier proteins alpha7beta1 integrin and utrophin. Both integrin and utrophin work together to restore lost muscle cell adhesion when dystrophin is missing at the muscle membrane. This approach should help all patients regardless of their dystrophin mutation.
- **What steps need to be completed before moving into a clinical trial?**
  We are currently building the manufacturing process to produce sufficient rhLAM-111 for all non-clinical purposes and Phase 1 clinical needs.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  Initiation of Phase 1 clinical testing in MDC1A patients is anticipated mid/2020 with proof of concept anticipated in 2022. Phase 2 clinical testing in Duchenne could begin following completion of Phase 1 clinical testing and with available funding.
- **Where would a clinical trial take place?**
  We have not made a decision but we anticipate clinical testing to occur at multiple sites.
- **Where can I learn more about this research?**
  - » www.Prothelia.com
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

RTC13

RTC13 Read-Through Compound- Development of a Drug that Corrects Nonsense Mutations in Patients with Duchenne

- **What stage is this research?**
  This research is pre-clinical, meaning it has not advanced to clinical trials involving people yet.
- **Where is this research being done and who is funding this research?**
  This research is being done at the University of California Los Angeles (UCLA) and is or has been funded in the past by the Muscular Dystrophy Association (MDA), the National Institute of Health (NIH), and the Department of Defense (DoD).
- **What is the goal or purpose of this research?**
  We have identified a molecule called RTC13 that can restore a full-length dystrophin protein in skeletal muscles of Duchenne patients affected by nonsense mutations.They are generally caused by single point mutations in the dystrophin gene that lead to the inappropriate presence of specific sequences (UAA, UAG or UGA) called stop codons. These stop codons cause a premature arrest in the synthesis of the dystrophin protein. As a result, no dystrophin is produced in skeletal muscles and heart. We have shown that this drug can restore dystrophin expression in muscles of mdx, a widely used animal model for Duchenne. We have developed an orally viable formulation of the compound that patients can take as a pill. We are also working on developing new compounds that could be used as an alternative in the event that RTC13 shows limited effects in patients. Our next step is to optimize the dose of these new compounds necessary to achieve therapeutic effects in Duchenne patients and to conduct the safety and toxicology studies required to file an Investigational New Drug (IND) application to the Food and Drug Administration (FDA). It has been estimated that approximately 13% of Duchenne patients could benefit from read-through of nonsense mutations. Importantly, because the drug restores full-length dystrophin, the protein being produced is expected to be fully functional and should be able to halt or at least counteract disease progression.
- **What is the current state of this research?**
  The research is still at the preclinical stage which means that it has only been tested in animal models for Duchenne.
- **What steps need to be completed before moving into a clinical trial?**
  We have completed proof-of-concept studies in the mdx mouse model for Duchenne. We are now focusing on conducting the toxicology studies needed to demonstrate that the compounds is safe to use in children and young adults. The steps necessary to conduct toxicology and safety studies will require extensive economical resources. As such, effort will be placed on identifying potential funding sources through US government grants and other advocacy groups.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  We need to secure sufficient funds to complete the toxicology studies before the compound can be moved into clinical testing.
- **Where would a clinical trial take place?**
  It is too early to know where a clinical trial for this research would be located.
- **Who would be eligible to participate in a clinical trial?**
  The inclusion criteria for perspective participants in clinical trials will have to be evaluated in detail based on the results obtained in animal studies and will be decided together with the sponsor of the trial and the FDA.
- **Where can I learn more about this research?**
  - » You can learn more about this research at http://bertonilab.neurology.ucla.edu/index.html.
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

SGT-001 Gene Therapy

AAV Delivery of Microdystrophin Gene Therapy Under Investigation to Restore Muscle Protein Expression in Duchenne

- **What stage is this research?**
  This research is in the pre-clinical stage. Solid Biosciences plans to initiate clinical trials involving people with Duchenne muscular dystrophy later this year.
- **Where is this research being done and who is funding this research?**
  This research is being done by Solid Biosciences and its partners at the University of Missouri, the University of Washington, the University of Florida, and Texas A&M University. Currently, the program is primarily funded by Solid Biosciences. The program has also received funding from the National Institutes of Health (NIH) and the Department of Defense (DoD). Duchenne Research Fund, Duchenne UK, and Joining Jack were initial investors in the project.
- **What is the goal or purpose of this research?**
  The goal of this research is to develop an adeno-associated virus (AAV) mediated gene therapy that enables the systemic delivery of a functional version of the dystrophin protein (microdystrophin) to the skeletal and cardiac muscles. This therapeutic approach will be studied for it potential to treat the majority of Duchenne patients, regardless of specific dystrophin mutation.
- **What is the current state of this research?**
  Findings from research in preclinical models have demonstrated that a single administration of the AAV-microdystrophin vector leads to significant expression of the microdystrophin protein in skeletal and cardiac muscles. Expression of microdystrophin was also associated with observed improvements in muscle histology and function.
- **What steps need to be completed before moving into a clinical trial?**
  Solid Biosciences is currently completing preclinical studies to support an IND submission to the FDA. Solid Biosciences is also developing a robust manufacturing process to ensure delivery to patients.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  Solid Biosciences anticipates initiating its clinical program in the second half of 2017.
- **Where would a clinical trial take place?**
  Many complex factors go into determining the right location(s) for a clinical program. Solid Biosciences is currently developing its clinical development plan and will communicate additional details at a later date.
- **Who would be eligible to participate in a clinical trial?**
  Solid Biosciences is working with experts to determine the right inclusion and exclusion criteria for its clinical program. Solid Biosciences is currently finalizing its clinical development plan and will communicate additional details at a later date.
- **Where can I learn more about this research?**
  - » You can learn more about this research at http://www.solidbio.com/
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

TVN-102 (Biglycan)

A Unique Utrophin and nNOS Upregulator Suitable for All Forms of Duchenne

- **What stage is this research?**
  This research is pre-clinical, meaning it has not advanced to clinical trials involving people yet.
- **Where is this research being done and who is funding this research?**
  This research is taking place at Tivorsan and in the laboratory of Dr. Justin Fallon at Brown University. This work was funded by PPMD's End Duchenne GAP program. Current funding is coming from private investors in Tivorsan, previously awarded PPMD and MDA foundation grants to Tivorsan, and an NIH grant ("UO1 mechanism") to Dr. Fallon.
- **What is the goal or purpose of this research?**
  The goal of this research is to use a protein called TVN-102 (recombinant human biglycan) to increase utrophin and neuronal NOS (nNOS) at the muscle cell membrane, resulting in reduced muscle damage and improved muscle function. Utrophin is a molecule that is related to dystrophin in structure and form and can "stand in" for dystrophin when present in larger than normal quantities.
- **What is the current state of this research?**
  Independent laboratories have reproduced the beneficial effect of TVN-102 in mice that lack dystrophin. A reliable method to manufacture the protein has been established and a scalable production process has been developed. Additional pre-clinical studies to support dosing in the clinic are currently in process. An optimized version of rhBGN has been developed and this molecule, called TVN-102, has been designated the lead clinical candidate.

  Tivorsan has held discussions with FDA to define its IND-enabling preclinical studies and early clinical development plan.
- **What steps need to be completed before moving into a clinical trial?**
  Manufacturing of TVN-102 needs to be scaled-up to produce quantities and purity necessary for use in humans.

  Safety testing must be completed and the pharmacology properties of TVN-102 must be determined.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  12 months
- **Where would a clinical trial take place?**
  It is too early to know where a clinical trial for this research would be located. Many complex factors go into determining the right location(s) for a clinical trial.
- **Who would be eligible to participate in a clinical trial?**
  Again, it is too early to know what the inclusion criteria would be for a future clinical trial. However, TVN-102 therapy is applicable to all forms of Duchenne, regardless of the underlying mutation.
- **Where can I learn more about this research?**
  - » You can learn more about this research at www.Tivorsan.com.
  - » www.ClinicalTrials.gov will post all clinical trials once they are actively recruiting patients.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Wave Life Sciences

Exon Skipping Investigational Drugs

- **What stage is this research?**
  This research is preclinical, meaning it has not advanced to clinical trials involving people yet.
- **Where is this research being done and who is funding this research?**
  WAVE is conducting the discovery research in-house at WAVE Life Sciences in Cambridge, MA, and in collaboration with Dr. Matthew Wood at the University of Oxford in the UK.
- **What is the goal or purpose of this research?**
  The goal of our research is to develop exon-skipping drugs that show increased dystrophin production and enhanced delivery in multiple muscle groups.
- **What steps need to be completed before moving into a clinical trial?**
  Required IND-enabling and safety preclinical studies will be conducted in order to file our IND. We plan to be in the clinic, in the second half of 2017.
- **Where would a clinical trial take place?**
  The company hopes to have clinical trial sites in the United States and in other countries outside the United States. Sites have not been selected at this time.
- **Who would be eligible to participate in a clinical trial?**
  Again, it is too early to know what the inclusion criteria would be for a future clinical trial. However, our plan is to include ambulatory and non-ambulatory patients in our trials.
- **Where can I learn more about this research?**
  - » www.wavelifesciences.com
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Becker Natural History Study

Becker Muscular Dystrophy: A Natural History Study to Predict Efficacy of Exon Skipping

- **What stage is this research?**
  This study is closed to new enrollment currently, but actively following previously enrolled participants. The investigators were very pleased to have reached and even exceeded their enrollment goals with 85 participants enrolled. The study enrollment officially closed on March 31, 2016.
- **What is the goal or purpose of this study?**
  This is a natural history study to characterize the Becker muscular dystrophy clinical presentation and also to provide information regarding the possible effectiveness of a therapy currently in development for Duchenne muscular dystrophy (exon skipping). Researchers will correlate specific genetic changes with a range of clinical outcomes including physical development, mental development, and quality of life in patients with Becker muscular dystrophy. The observed variability between individuals with Becker muscular dystrophy will be studied to deepen our understanding of molecular mechanisms relevant to the optimization of exon skipping therapeutic approaches, as well as to optimize study designs and outcome measures for future clinical trials in Becker muscular dystrophy.
- **Who is funding this study?**
  This study is funded by the National Institutes of Health (NIH).
- **Who was eligible to participate in this study?**
  Enrolled participants were male with Becker muscular dystrophy, age 4 and above, with an in-frame dystrophin gene deletion where the boundaries of the mutations are confirmed.
- **Where does this study take place?**
  This study enrolled participants at select Cooperative International Neuromuscular Research Group (CINRG) network sites and affiliates. The participating centers include:
  - » Children's National Medical Center in Washington DC
  - » University of Pittsburgh in Pittsburgh, PA
  - » Carolinas Medical Center in Charlotte, NC
  - » University of Minnesota in Minneapolis, MN
  - » Ann & Robert H. Lurie Children's Hospital of Chicago in Chicago, IL
  - » University of California, Davis, in Sacramento, CA
  - » Alberta Children's Hospital in Calgary, Canada
  - » University of Tennessee in Memphis, TN
  - » University of Florida in Gainesville, FL
  - » Newcastle University in Newcastle upon Tyne, United Kingdom
  - » Children's Healthcare of Atlanta/Emory University in Atlanta, GA
  - » Penn State Hershey Medical Center in Hershey, PA
  - » Duke University in Durham, NC
  - » Centro Clinico Nemo in Milan, Italy
  - » UT Southwestern Medical Center in Dallas, TX
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.clinicaltrials.gov (NCT01539772).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Coenzyme Q10 and Lisinopril

Clinical Trial of Coenzyme Q10 and Lisinopril in Muscular Dystrophies

- **What stage is this research?**
  This clinical trial is closed to new enrollment, and all participant data has been collected. The study added an extension study that collected longer-term cardiac data on a subset of participants in the parent study. During the coming months, the study team is locking the data and starting analysis on the dataset.
- **What was the goal or purpose of this study?**
  This is a clinical trial to test a medication used for the heart, called Lisinopril (an angiotensin converting enzyme (ACE) inhibitor) and supplement called Coenzyme Q10, to ameliorate the decline in cardiac muscle functions that occurs in muscular dystrophies. The goal of this study is to determine if Coenzyme Q10 alone, Lisinopril alone, or a combination of Coenzyme Q10 and Lisinopril is more effective at delaying the onset of cardiac symptoms in patients with Duchenne, Becker, or Limb Girdle muscular dystrophy.
- **Who is funding this study?**
  This study is funded by the Department of Defense (DoD).
- **Who was eligible to participate in this study?**
  Participants had a confirmed genetic diagnosis of Duchenne, Becker, or Limb Girdle muscular dystrophy (certain type 2 only), were 8 years of age or older, and had no clinical cardiac symptoms with a normal left ventricular fractional shortening (>28%) on echocardiogram.
- **Where did this study take place?**
  This study enrolled participants at select Cooperative International Neuromuscular Research Group (CINRG) network sites. These sites include: Children's National Medical Center, Washington, DC; Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; Carolinas Medical Center, Charlotte, NC; University of Pittsburgh, Pittsburgh, PA; University of Tennessee, Memphis, TN; National Center of Neurology and Psychiatry, Tokyo, Japan; and Alberta Children's Hospital, Calgary, Alberta, Canada.
- **When is the study anticipated to be completed and results available?**
  The clinical trial and the extension anticipate having results available in late 2017.
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.clinicaltrials.gov (NCT01126697).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Domagrozumab (PF-06252616)

Development of a Myostatin Inhibitor (Domagrozumab) as a Potential Therapy for Duchenne

- **What stage is this research?**
  This is a Phase 2 randomized, double-blind, placebo-controlled, multiple ascending dose study to evaluate the safety, efficacy, pharmacokinetics, and pharmacodynamics of Domagrozumab (PF-06252616) administered to ambulatory boys diagnosed with Duchenne muscular dystrophy. Enrollment of participants has completed.

  Additional details about this study can be found at www.ClinicalTrials.gov (NCT#02310763) or www.dmdmyostatintrial.com.

  Participants completing the Phase 2 study of PF-06252616 may be eligible to enroll in the open-label extension study of Domagrozumab (PF-06252616). Information about the open-label extension study may be found at www.ClinicalTrials.gov (NCT#02907619).

- **What is Domagrozumab?**
  Domagrozumab is an investigational drug (not approved for commercial use) designed to block the activity of myostatin. Myostatin is a protein that acts in the body to prevent muscle from growing too large. This drug is being tested to see if blocking myostatin will help to increase muscle strength and function in boys with Duchenne.

- **What were the inclusion (enrollment) criteria for this trial?**
  Participants must be ambulatory boys with Duchenne who are 6 to <16 years of age.

  Eligible participants must also able to perform the 4-stair climb in > 0.33 stairs/second ≤1.6 stairs/second (with or without the use of handrails).

  The diagnosis of Duchenne must be confirmed in the individual's medical history and by genetic testing obtained during routine medical care. Please note: The investigational therapy is not mutation-specific, so boys with any Duchenne gene mutation may participate.

  Eligible participants must be on glucocorticosteroids for a minimum of 6 months prior to signing informed consent to join the study.

  Participants must be able to tolerate MRI scanning.

  Additional screening evaluations will be conducted at the study site to confirm eligibility.

- **What happens during the course of the study?**
  Participants receive monthly IV infused doses for up to 2 years at their study site.

  Based on the design of the study, all participants receive the investigational drug during half or all of the duration of the study.

  Participants undergo safety evaluations at regular intervals (including monthly clinical exams and blood tests).

  Participants undergo functional evaluations (including the 4-stair climb and 6 minute walk test every 2 months and MRI scans to evaluate the leg muscles).

- **Where is the trial taking place?**
  Study sites exist in the United States, Canada, Italy, United Kingdom, Poland, Bulgaria, Australia, and Japan. Please check www.clinicaltrials.gov for details regarding the trial sites

- **Where can I learn more about this study?**
  - » The current study is posted on www.ClinicalTrials.gov (NCT#02310763)
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

- **Is Pfizer committed to pursuing possible treatments for Duchenne?**
  Our investment in Duchenne currently extends beyond Domagrozumab. Pfizer is also advancing pre-clinical work with Bamboo Therapeutics on PF-06939926, a mini-dystrophin gene therapy for Duchenne.

  Pfizer is an active participant in advocacy/academic/industry consortia.

DP ARF Ultrasound

Double Push Acoustic Radiation Force (DP ARF) Ultrasound for Monitoring Degeneration in Duchenne Muscular Dystrophy

- **What stage is this research?**
  This study is active, but no longer recruiting participants.
- **What is the goal or purpose of this study?**
  This is a pilot clinical trial to assess the ability of a new ultrasound-based imaging method, Double-Push Acoustic Radiation Force (DP ARF) ultrasound, to monitor the progression of Duchenne muscular dystrophy.
- **Who is sponsoring this study?**
  This study is sponsored by the University of North Carolina, Chapel Hill, in collaboration with the National Institute of Neurological Disorders and Stroke (NINDS).
- **Who was eligible to participate in this study?**
  The study population includes 30 boys with Duchenne, enrolling at ages 5 to 10 years. To be considered for enrollment, boys must have had a clinical onset of Duchenne by age 5. Male siblings with no known neuromuscular disorders, ages 5 to 10 years, were also eligible for enrollment as controls.
- **What are participants doing in this study?**
  All boys will be imaged 3 times annually for 4 years. In addition to DP ARF imaging every 4 months, the boys will undergo standard quantitative muscle testing (QMT) and timed function tests (TFT) of time to standing, 6-minute walk, and 30-feet walk. Age at loss of ambulation will also be recorded for each boy.
- **Where does this study take place?**
  This study takes place at the University of North Carolina, Chapel Hill (UNC-CH).
- **When can I expect to hear results from this study?**
  The researchers will be collecting data through August 2017, and then they will be processing the data and interpreting the results for several months.
- **Where can I learn more about this study?**
  - » You can learn more about this study at ClinicalTrials.gov (NCT01506518) and http://dmdultrasound.bme.unc.edu .
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Edasalonexent (CAT-1004)

Catabasis' MoveDMD® Trial

- **What stage is this research?**
  Currently, the Phase 2 part of the MoveDMD® trial is ongoing. MoveDMD is a Phase 1/2 clinical trial in boys with Duchenne muscular dystrophy. The first part of the trial (Part A) has completed and the results were positive: edasalonexent was generally well tolerated, there were no safety issues, the pharmacokinetics were in line with what was expected, and biomarkers showed an effect on target genes. The second part of the trial (Part B) is complete. Although the magnetic resonance imaging (MRI) T2 composite primary endpoint at 12 weeks was not achieved, all 6 function-associated exploratory endpoints assessed in Part B showed numerical improvement in the higher dose group compared to placebo, although not statistically significant. This includes the 4-stair climb, 10-meter walk/run, time to stand and the North Star Ambulatory Assessment as well as pediatric outcomes data collection instrument (PODCI) and muscle strength. No safety signals were observed in Part B and plasma exposure in Part B of the trial was consistent with that observed in Part A. The third part of the MoveDMD trial (Part C) is ongoing. In Part C, patients receive open-label edasalonexent for 60 weeks. Catabasis is expecting to report results from Part C periodically throughout the year.
- **Where is this research being done and who is funding this research?**
  This research is being done by Catabasis, a clinical-stage biopharmaceutical company with a mission to bring hope and life-changing therapies to patients and their families. Catabasis is focused on the treatment of rare diseases, including Duchenne. Both PPMD and MDA have supported patient travel for the MoveDMD trial.
- **What is the goal or purpose of this research?**
  Edasalonexent is an oral small molecule investigational drug candidate that has been observed to inhibit NF-kB. Dystrophin is a protein that keeps muscles healthy by maintaining the structure of muscle cells. In boys with Duchenne, the absence of dystrophin combined with mechanical stress in muscle leads to activation of NF-kB, which in turn drives muscle damage and prevents muscle regeneration. By inhibiting NF-kB, we believe
  that edasalonexent may reduce muscle damage and regenerate muscle in boys with Duchenne.
- **Where does the clinical trial take place?**
  Participating sites for the MoveDMD trial: Shriners Hospitals for Children, Portland, OR; The Children's Hospital of Philadelphia, Philadelphia, PA; University of Florida, Gainesville, FL; Nemours Children's Hospital, Orlando, FL; and University of California Los Angeles, Los Angeles, CA.
- **Who is eligible to participate in the clinical trial?**
  Although enrollment is closed, requirements for participating in this clinical trial include:
  - » Boys with a diagnosis of Duchenne (any confirmed mutation) between the ages 4 and 7 years
  - » Ability to walk independently
  - » No corticosteroid use within the past 6 months and no plans to start corticosteroids in the next 6 months
  - » The key inclusion and exclusion criteria for this clinical trial are available at www.clinicaltrials.gov.
- **What will participants do in Part C of this trial?**
  Participants will receive edasalonexent for up to 60 weeks in Part C. Data on MRI of the leg muscles, physical function assessments, and muscle strength will be collected at ~12 week intervals throughout the study.
- **Where can I learn more about this research?**
  - » You can learn more at www.catabasis.com and www.ClinicalTrials.gov.
  - » You can contact Catabasis directly with any questions at Joanne.Donovan@catabasis.com.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Follistatin Gene Transfer

Follistatin Gene Transfer to Patients With Becker Muscular Dystrophy and Sporadic Inclusion Body Myositis

- **What stage is this research?**
  This Phase 1 trial is ongoing but not recruiting participants.
- **Where is this research being performed and who is funding this research?**
  This research is being led by Dr. Jerry Mendell at Nationwide Children's Hospital Research Center in Columbus, Ohio. It is being funded by PPMD's GIFTED Program.

  Follistatin is a muscle growth-stimulating protein. This research is intended to build upon preliminary studies in mice with muscular dystrophy and in non-human primates which demonstrated that the follistatin gene, when injected into muscles, can cause significant increases in the size of injected muscles and improvements in the strength of injected muscles. If successful, the investigators can potentially prolong a patient's ability to walk.

  The gene will be carried into the muscle by a virus called adeno-associated virus (AAV). This virus occurs naturally in muscle and does not cause any human disease.
- **What do participants have to do in this study?**
  Participants with either of these diseases (Becker muscular dystrophy or Sporadic Inclusion Body Myositis) will have shots of the follistatin gene injected directly into their thigh muscle on one or both legs (one time only). A muscle biopsy will be done during the screening visit and 180 days following the gene delivery. Once both muscle biopsies are completed, the biopsies will be looked at closely to see if the muscle fibers are bigger. At day 180, participants will undergo testing to see if their muscle strength has improved. Between the time of the gene transfer and the muscle biopsy at day 180, participants will be carefully monitored for any side effects of the treatment. This will include an MRI of the thigh muscle before treatment and at day 180 following treatment. Blood and urine tests, as well as physical examination will be done on the participants during the screening visit and several times throughout the study to make sure that there are no side effects from the gene injections.
- **What are the future plans for this research?**
  If this study is successful, the investigators will expand the research to a Phase 2 study and will also make plans to test it in patients with Duchenne muscular dystrophy.
- **Where can I learn more about this research?**
  - » You can learn more about this research at www.nationwidechildrens.org/center-for-gene-therapy and www.clinicaltrials.gov (NCT01519349).
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Follistatin Gene Transfer

Clinical Intramuscular Gene Transfer of rAAV1.CMV.huFollistatin344 Trial to Patients With Duchenne

- **What stage is this research?**
  This Phase 1/2 trial is ongoing but not recruiting participants.
- **Where is this research being performed and who is funding this research?**
  This research is being led by Dr. Jerry Mendell at Nationwide Children's Hospital Research Center in Columbus, Ohio.
- **What is the goal or purpose of this research?**
  The proposed clinical trial is an outgrowth of the safety record and functional improvement seen in the Becker/sIBM follistatin gene therapy trial. Follistatin is a muscle growth-stimulating protein. In this study the investigators propose to inject the follistatin gene into muscle using a virus called adeno-associated virus (AAV1.CMV.huFS344). This virus occurs naturally in muscle and does not cause any human disease. If successful, the investigators can potentially prolong a patient's ability to walk.
- **Who was eligible to participate in this study?**
  Six male Duchenne patients, age 7 years or older, with a proven mutation of the dystrophin gene were recruited. Participants must have impaired muscle function based on clinical evidence, and they must be on stable dose of prednisone for three months at time of enrollment or be started on oral dose of daily prednisone regimen for 30 days prior to gene transfer.
- **What do participants have to do in this study?**
  The viral vector will be delivered to the legs of six Duchenne patients via multiple, direct intramuscular injections of rAAV1.CMV.huFollistin344. The number of injections per muscle will depend on the size of the patient. A total dose of 2.4E12 vg/kg (1.2E12vg/kg/limb) will be delivered. This dose will be divided between gluteal muscles, quadriceps, and tibialis anterior. This is a wider distribution of vector than given to Becker patients, who overall improved the distance walked on the 6MWT without adverse events related to viral transduction into a single muscle.

  The primary objective of this study is safety. Endpoints will include hematology, serum chemistry, urinalysis, immunologic response to rAAV1 and follistatin, and reported history and observations of symptoms. Efficacy measures will be used as secondary outcomes and include the distance walked on the 6MWT, functional tests by PT, life quality questionnaire, MRI, EIM, and muscle biopsy. Participants will have follow up visits on days 7, 14, 30, 45, 60, 90, 180 and 9, 12, 18 and 24 months post-gene transfer.
- **Where can I learn more about this research?**
  - » You can learn more about this research at www.nationwidechildrens.org/center-for-gene-therapy and www.clinicaltrials.gov (NCT02354781) or contact the coordinator Markus McColly, Markus.McColly@nationwidechildrens.org, 614-355-2825
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

FOR-DMD

Finding the Optimal Steroid Treatment for Duchenne Muscular Dystrophy

- **What stage is this research?**
  The study is ongoing but recruitment ended in September, 2016.
- **What is the goal or purpose of the FOR-DMD study?**
  This study will look at the benefits and side effects of the three most widely prescribed steroid treatments for Duchenne muscular dystrophy. The type of steroids commonly prescribed for Duchenne are called corticosteroids. Corticosteroids are a type of drug similar to natural hormones produced by the adrenal glands that reduce inflammation and suppress the immune response. They are often prescribed to boys with Duchenne. These steroids may have an effect on stabilizing or even improving muscle strength for a period of time but not all boys respond to treatment. The main steroid that is used is called prednisone. Deflazacort is also used in some countries. These are not "anabolic steroids" which is what athletes use illegally to build up muscle - these do not have an effect in Duchenne. Sometimes they are referred to as 'glucocorticoids'.
- **We will compare three different treatment groups:**
  - » Daily prednisone.
  - » Daily deflazacort.
  - » Intermittent prednisone (10 days on / 10 days off).

  The study is randomised (your boy's treatment group will be decided randomly, as in drawing names from a hat or tossing a coin) and double-blind which means that neither participants nor their doctors will know which group the boy is in (until the study is completed).

  All three steroid treatments are commonly used in boys with Duchenne and have been shown to be beneficial. Benefits include an increase in the length of time that the boys can continue to walk, reduction in the development of curvature of the spine, a longer time of adequate breathing, and possibly protection against the development of heart problems.

  However, we do not yet know which steroid treatment has the most benefit and most tolerable side effects. Therefore, this is a trial of present day steroid use which is needed because the practice of prescribing steroids varies a lot across doctors. This means that patients may not be getting the best possible treatment and management of side effects. All boys in this study will be receiving treatment with steroids and will be managed as per the recognized standards of care.

  Analyses of the baseline data are currently underway and information will be shared on ClinicalTrials.gov (NCT01603407), as it becomes available.
- **Who was eligible to be in this study?**
  This study was open to boys with a confirmed diagnosis of Duchenne by genetic test, ages 3 - 7 years old and NOT previously treated with steroids except by inhaler or as an ointment.
- **Where does this study take place?**
  This study is taking place in numerous muscle clinics in the US, Canada, UK, Germany, and Italy. Please visit www.clinicaltrials.gov for a complete list of all study sites. The principal investigators are Dr. R Griggs at the University of Rochester, NY and Prof. K Bushby at Newcastle University, UK.
- **What are participants doing during the study?**
  After the screening period, participants will visit the study site at 3 months and then every 6 months after that. There will be a total of around 8-13 visits depending on when enrollment begins. At each visit, boys will be assessed to monitor benefits and side effects of corticosteroids. We expect that most boys will be in the study for 3-5 years.
- **Who is funding this study?**
  This study is funded by the US National Institutes of Health (NINDS). Parent Project Muscular Dystrophy and the MDA have also provided funding for this study.
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.for-dmd.org and www.clinicaltrials.gov (NCT01603407).
  - » You can view the PPMD webinar on the FOR-DMD study: https://www.youtube.com/watch?v=W7B24zpBrDw
  - » You can also contact the FOR-DMD US Project Manager, Kimberly Hart, at telephone 585-275-3767 or email Kim_Hart@urmc.rochester.edu.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Gene Transfer of Micro-Dystrophin

Clinical Intramuscular Gene Transfer Trial of rAAVrh74.MCK.Micro-Dystrophin to Patients with Duchenne

- **What stage is this research?**
  This is a Phase 1 clinical trial is ongoing but not recruiting participants.
- **What is the goal or purpose of this study?**
  The goal of this study is evaluate safety and biological activity of the micro-dystrophin vector as part of the process in determining if it can act as a potential dystrophin replacement for Duchenne muscular dystrophy. There will be two groups: one high dose and one low dose group. Both groups receive escalating doses injected into the Extensor Digitorum Brevis (EDB) muscle to determine the maximum tolerated dose (MTD). The EDB muscle is a muscle on the upper part of the foot. Each group will have three participants.
- **Who is funding this study?**
  This study is funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD).
- **Who was eligible to participate in this study?**
  Participants are boys at least 10 years old or older, wheelchair-dependent, with a confirmed dystrophin mutation based on mutation compatibility with microdys cDNA, and able to cooperate with muscle testing.
- **What are participants doing in this study?**
  This study involves injection of the micro-dystrophin therapy into the EDB muscle (on the upper part of the foot). It also involves some lab studies (blood and urine) and return visits over the course of 2 years. There will also be a muscle biopsy on the EDB muscle on day 180 in one foot, compared to the placebo treated muscle biopsy in the opposite foot.
- **Where does this study take place?**
  This study takes place at Nationwide Children's Hospital, Columbus, Ohio.
- **What are the future plans for this research?**
  The success of this study will establish the proof of principle for the micro-dys that will be used for the next study with systemic vascular delivery.
- **Where can I learn more about this research?**
  - » You can learn more about this study at www.DuchenneConnect.org and www.ClinicalTrials.org (NCT02376816) as well as http://www.nationwidechildrens.org/gene-therapy-clinical-studies--1. You can also contact the study coordinator Beverly Galliers at Beverly.Galliers@NationwideChildrens.org or 614-355-3424.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

HOPE

Halt cardiOmyopathy ProgrEssion in Duchenne

- **What is the HOPE-Duchenne trial?**
  HOPE-Duchenne is a Phase II clinical trial that evaluates if CAP-1002, an investigational cardiac stem cell therapy, is safe and potentially effective in treating boys and men with heart disease related to Duchenne muscular dystrophy. This trial includes an assessment of the amount of scar tissue in the heart muscle before and after infusion of the investigational cardiac stem cell therapy compared to scar remaining after usual care.

  Enrollment in the HOPE-Duchenne trial closed in September 2016. Final results are anticipated in November 2017.

- **What is CAP-1002?**
  CAP-1002 is a biologic product consisting largely of adult heart stem cells grown from donated tissue from adult heart muscle. These cells have been shown to be potentially anti-inflammatory, anti-fibrotic, and reduce cell death. When studied in the setting of a heart attack in adults, CAP-1002 has been shown to reduce the size of scar in the heart and increase viable muscle.

- **Who funded this trial?**
  This trial is funded by Capricor, Inc with support from the California Institute for Regenerative Medicine (CIRM).

- **What happens in this trial?**
  Participants that qualified for the trial were randomly assigned to one of two treatment groups: 1) those who received CAP-1002 and usual care that you would normally get from your doctor, or 2) those who receive usual care alone.

  Participants randomly assigned to receive CAP-1002 visited the study hospital to have the cells infused into the arteries of their heart. The whole treatment took about one hour, and an overnight hospital stay was needed for observation.

  This trial involves questions about medical history, and regular check-ups including blood tests, ECGs, heart MRIs, a heart monitor worn at home, simple measures of muscle function, and breathing tests.

  Participants will participate in this trial for approximately 13 months. HOPE is being conducted at three U.S. sites.

- **Are any results available?**
  Capricor recently completed the 6-month interim analysis of the HOPE-Duchenne trial. Below is a summary of the results presented in a public webinar on April 25, 2017, which can be access on Capricor's website: http://capricor.com/news/events/.
  25 participants were randomized in the trial: 13 were assigned to the CAP-1002 treatment group, and 12 were assigned to the usual care treatment group.

  CAP-1002 has been well-tolerated by participants in the HOPE trial. The most common adverse events were atrial fibrillation (20%) and the common cold (16%). The atrial fibrillation is an irregular heartbeat that occurred during the delivery of CAP-1002 in the arteries of the heart. The atrial fibrillation resolved on its own, and participants did not experience any other symptoms. No serious adverse events were evaluated as related to the CAP-1002 investigational product.

  We observed approximately a 5% reduction in measured scar size in the hearts of those who received CAP-1002 when compared to a negligible change in the usual care group, which appears consistent with the natural history of Duchenne cardiomyopathy. Although this did not achieve statistical significance ($p=0.09$), this is a notable observation, since scar progressively increases over time in Duchenne.

  Improvements were observed in the heart's wall thickening in those who received CAP-1002 compared to the usual care group. Wall thickening is very important to the heart's ability to contract correctly and effectively push out blood to your body. Statistically-significant increases were seen in thickening of the inferior wall of the left ventricle ($p<0.05$). Wall thickening of the anterior and later walls in the CAP-1002 group also trended towards improvement, but did not meet statistical significance.

  Significant improvements in ejection fraction as well as in end-systolic and end-diastolic volumes were not observed. This was not an unexpected finding after a single dose of CAP-1002 and short term heart function monitoring.

  In the Performance of Upper Limb (PUL), there was a significant improvement in upper limb function in the middle (i.e., elbow) and distal (i.e., hands) levels at Week 6 ($p<0.05$) in the CAP-1002 treatment group compared to the usual care group via responder analysis. However, this effect became less pronounced by month 3, and disappeared by month 6.

- **What are future plans for CAP-1002 in DMD?**
  The HOPE-Duchenne trial will continue throughout 2017 until the last month 12 visit is complete. After which, if the one-year results of the study demonstrate that CAP-1002 is safe according to an independent data review committee, participants randomly assigned to usual care group will be eligible to receive the stem cell infusion after completing the trial.

(Continued on p.61)

(Continued from p.60)

Finally, Capricor is evaluating repeat dosing of CAP-1002 via intravenous infusion in patients with Duchenne. Additional details on this next trial will be provided as plans mature.

- **Where can I learn more?**
  - » For information about Capricor and HOPE-Duchenne trial, please visit www.capricor.com and our ClinicalTrials.gov site at NCT02485938.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

HT-100

A Potent Anti-fibrotic that Decreases Scar Tissue and Demonstrates Improved Strength in Duchenne boys

- **What stage is this research?**
  HT-100 has been tested in 16 boys with Duchenne at varying stages of disease progression. Boys have been dosed for up to 18 consecutive months. The clinical trial went on hold in January 2016. After a thorough review of data, the FDA has approved continuation of the clinical development program.
- **Where is this research being done and who is funding this research?**
  This program is being conducted by Akashi Therapeutics, a company developing three Duchenne treatments that can work alone or in concert to revert, halt or slow disease progression.
- **What is the goal or purpose of this research?**
  Fibrosis is a critical component of Duchenne's downstream pathology, the only associated pathology directly related to disease prognosis. HT-100, a daily tablet, is a potent antifibrotic. It also has anti-inflammatory and muscle regeneration impact. HT-100 is the first drug since steroids to increase muscle strength over baseline in boys and young men with Duchenne.
- **What is the current state of this research and what steps need to be completed before moving into a clinical trial?**
  A Phase 2 clinical trial in Duchenne patients was put on hold by the FDA in January 2016 after a death in the clinical trial. The company conducted a thorough investigation, and ultimately determined that it is safe and appropriate to continue developing HT-100. The FDA has approved dosing at a lower dose than has been used in studies to date. Plans are being finalized to conduct a small, relatively quick clinical study designed to tell us whether the low dose results in the expected drug exposure levels. If the answer is yes, the next step is to conduct a clinical study to determine whether that dose is safe and effective.
- **What is your best estimate for the length of time it will take to move this research into clinical trials?**
  The next phase of clinical testing can begin in the second half of 2017.
- **Where would a clinical trial take place?**
  Clinical sites for the next trial have not yet been announced.
- **Who would be eligible to participate in a clinical trial?**
  It is too early to know what the inclusion criteria will be for the next clinical trial. However, Akashi recognizes the tremendous sacrifices and dedication of families who have participated in HT-100 trials to date, and will honor that by first extending clinical trial participation opportunities to those families.
- **Where can I learn more about this research?**
  - » You can learn more about HT-100 (and other Akashi initiatives) by consulting the Akashi website at:
  - » http://akashirx.com
  - » www.ClinicalTrials.gov will post all HT-100 clinical trials once they are actively recruiting subjects.
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

PhaseOut DMD

A 48 week Phase 2 Clinical Study to Assess the Activity and Safety of Utrophin Modulation with Ezutromid (Formerly Known as SMT C1100) in Ambulatory Boys with Duchenne

- **What stage is this research?**
  Ezutromid is in a Phase 2 proof-of-concept clinical trial, called PhaseOut DMD.
- **What is utrophin and utrophin modulation?**
  Utrophin is a naturally occurring protein that is functionally and structurally similar to dystrophin. Utrophin is produced naturally during the early stages of muscle fiber development but is turned off in maturing muscle fibers, as dystrophin steadily increases to perform the same functional role. When a muscle fiber is damaged, utrophin is produced during the repair process. Summit's utrophin modulation approach aims to use small molecule drugs to maintain the production of utrophin to compensate for the absence of dystrophin in patients with Duchenne and so has the potential to maintain healthy muscle function.

  Ezutromid is an orally administered utrophin modulator that has the potential to benefit all patients regardless of their dystrophin mutation. This is Summit's most advanced utrophin modulator while the Company is also advancing an earlier-stage pipeline of future generation molecules. Summit believes that the approach of utrophin modulation could be complementary to other therapeutic approaches currently in development or that are approved.
- **What is the goal or purpose of this study?**
  PhaseOut DMD is a 48-week open label trial that aims to provide proof of concept for ezutromid and utrophin modulation through measurements of muscle fat infiltration using magnetic resonance imaging (MRI), and measuring utrophin protein and muscle fiber regeneration by analysis of muscle biopsies. All patients will have two muscle biopsies – one at baseline and a second after either 24-weeks or 48-weeks of dosing with ezutromid. Exploratory endpoints include the six-minute walk distance, the North Star Ambulatory Assessment and patient reported outcomes.
  At the end of the 48-week period, patients participating in the trial will have the opportunity to be transitioned into an open-label extension phase.
- **What is the current status of the trial?**
  This trial has recently completed enrolment of patients with dosing of patients still ongoing. Some of the key inclusion criteria for being able to participate in this trial included:
  - » age ranging from 5th to 10th birthday with confirmation of Duchenne diagnosis through genetic testing or muscle biopsy,
  - » ability to walk a prespecified distance that is at least 300 meters unassisted in a 6-minute walk test, and
  - » being on a stable regimen of corticosteroids for at least 6 months prior to enrollment.
- **When will data from the trial be reported?**
  Summit expects to report interim data from trial in the first quarter of 2018. This is planned to include data from all of the patients who will have their second muscle biopsy after 24-weeks of dosing, as well as the 24-week analysis of MRI and functional data from all patients in the trial. We plan to analyze all 24-week treatment biopsies once all samples have been collected. In addition to reporting on the 24-week biopsy data, we also expect to announce the 24-week analysis of MRI and functional data from all patients in the trial.
- **What are the next steps for the development of ezutromid?**
  In addition to PhaseOut DMD, Summit plans to conduct a randomized, placebo controlled trial designed with the potential to support accelerated and conditional approvals in the US and Europe, respectively. It is anticipated that this trial would start after positive data from PhaseOut DMD, and the Company would plan to provide timing guidance following the release of the 24-week dataset.
- **How long until ezutromid could be available on the market?**
  Summit is currently focused on the PhaseOut DMD trial. If this is successful, Summit would expect to run a larger, global registration trial, and the timing and length of that trial would be largely determined by what is seen in PhaseOut DMD and discussions with the regulatory authorities.
- **Why should I consider participating in clinical trials of a utrophin modulator?**
  While no personal benefit can ever be guaranteed by participation in a clinical trial, there are other benefits, including allowing you to play an active role in your own health care (or that of your child), gaining access to new research treatments before they are widely available, having access to medical specialists that are normally not available to you or your child, and helping others by contributing to the better understanding of Duchenne.
- **Where can I learn more about this research and other future clinical studies?**
  - » Sign up for clinical trial alert emails at www.utrophintrials.com
  - » More information on PhaseOut DMD is available at https://clinicaltrials.gov/ct2/show/NCT02858362
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

Spironolactone and Eplerenone

Therapeutic Potential for Aldosterone Inhibition in Duchenne Muscular Dystrophy

- **What stage is this research?**
  This Phase 3 trial is active, but no longer recruiting participants.
- **What is the goal or purpose of this study?**
  The purpose of the study is to compare the effect on heart and lung function of two available generic drugs use for other conditions. We will see if spironolactone works just as well as eplerenone, which was previously shown to be effective in boys with Duchenne.
- **Who is sponsoring this study?**
  This study is sponsored by the National Institutes of Health.
- **Who was eligible to participate in this study?**
  Participants must be males with Duchenne, at least 10 years old, able to have an MRI scan and not taking eplerenone or spironolactone. Please see www.ClinicalTrials.gov for additional inclusion and exclusion criteria.
- **What will participants do in this study?**
  Participants will be randomly assigned to receive either eplerenone or spironolactone, and they will take one tablet of the assigned drug once daily for 12 months.

  All participants will have blood drawn at the baseline visit as well as months 1, 2, 3, 6, 9, and 12.

  All participants will have an MRI scan and pulmonary function tests at baseline and 12 months.
- **Where does this study take place?**
  The study takes place at the following 4 sites:
  - » The Ohio State University (OSU) in Columbus, OH
  - » Mattel Children's Hospital in Los Angeles, CA
  - » University of Colorado Hospital in Aurora, CO
  - » University of Utah Hospital in Salt Lake City, UT
- **When can we expect results from this study?**
  Researchers estimate that results from this study will be available at the end of 2018.
- **Where can I learn more about this study?**
  - » You can learn more about this study at www.ClinicalTrials.gov (NCT02354352)

  You may also contact:
  - » Dr. Subha Raman at The Ohio State University, (614) 688-8020 or raman.1@osu.edu
  - » Dr. Nancy Halnon at Mattel Children's Hospital, (310) 267-7618 or nhalnon@mednet.ucla.edu
  - » Dr. Scott Auerbach at University of Colorado, (720) 777-8723 or scott.auerbach@childrenscolorado.org
  - » Dr. Michael Puchalski at University of Utah, (801)587-9104 or Michael.puchalski@hsc.utah.edu
  - » Please check www.DuchenneConnect.org for updates to this FAQ sheet.

GLOSSARY

Adverse Event (AE)
An event that happens in a study to the patient while receiving the treatment/therapy. It may or may not be caused by the treatment or therapy.

Assent
Children under the age of 18 are not legally able to provide informed consent. Instead, they are asked for their assent (meaning they agree to take part in the study). Assent is obtained in addition to parental/guardian informed consent. Assent is usually obtained from the ages of 7-17, but this does vary depending on the local IRB.

Biomarker
Typically some type of lab test or value that can be objectively measured and evaluated. The biomarker can serve as an indicator of the normal biological process, disease process, or pharmacologic responses to a therapy/treatment. A biomarker in Duchenne could be dystrophin in a muscle biopsy or an MRI of a muscle. Right now there are no approved or "validated" biomarkers for Duchenne, but companies are using them in trials to add to the clinical evidence and will hopefully have them validated over time.

Blinding of Study
At least one or more parties involved in the trial, such as the researcher or the people in the study, do not know which people have been assigned which treatment group.

Carrier
In Duchenne, women who carry one copy of the genetic change that causes Duchenne or Becker. The woman also has another copy of the dystrophin gene that does not contain the genetic change. Carriers have a 50% chance of passing the mutation on to each pregnancy.

Clinical Endpoint
Measure of events or outcomes such as symptoms, functional abilities, laboratory tests, etc., that help objectively determine if the therapy or medication is working.

Clinical Research
The study of health and illness in people. It can include things like the cause, prevention, diagnosis, treatment, or progression of a disease.

Clinical Trial Randomization
In a clinical trial, people are assigned by chance to separate groups that compare different treatments. A participant cannot choose which group to be in and neither can the researcher.

Compassionate Use
See "Expanded Access"

Data Safety Monitoring Board (DSMB)
Group of experts that advises the study investigators about the study safety. They can make recommendations throughout the study that could affect whether the study continues, is modified, or is stopped because of safety concerns.

DNA
Deoxyribonucleic acid (DNA) is the chemical inside the nucleus of all cells that carries the genetic instructions for making living organisms.

DNA Sequencing
A method of testing that is like proofreading a sentence. With DNA sequencing you determine the exact genetic code of the area you are studying. Different people can have slightly different sequences (variants) with little or no impact on how well the gene works. This is normal variation and is what makes us each unique. However, some errors in a gene's sequence can have serious consequences and cause diseases like Duchenne.

Double Blind Study
Two or more parties involved (such as the researcher and the person in the study) do not know which people have been assigned which treatment groups.

Exclusion Criteria
A list of things that exclude a patient from being in a study.

Expanded Access
A means by which companies can make investigational new drugs available, under certain circumstances, to treat a patient(s) with a serious disease or condition who cannot participate in a controlled clinical trial. FDA must approve the use, the company must be willing to supply the drug, and a treating physician must be willing to monitor the patient.

Gene
A gene is, in essence, a part or portion of DNA that gives the body instructions on how to make specific proteins such as dystrophin.

Heterozygote
A person who has one copy of a gene with a genetic change. Humans typically have two copies of most genes. When you are a heterozygote for a particular gene change, it means one copy of your gene contains the gene change, while the other copy does not.

Inclusion Criteria
A list of features such as age, mobility status, disease state, etc., that must be met to be in a study.

Informed Consent
The voluntary permission from a person stating they are willing to be in a clinical trial. Before a person gives their consent, the study coordinator will review with them information about the trial, including what the study is trying to show (potential benefits, risks and inconveniences, alternative therapies available) and of the person's rights and responsibilities.

Institutional Review Board (IRB)
An independent group of professionals designated to review and approve the study which includes the protocol, informed consent forms, study advertisements, and patient brochures. The IRB's job is to ensure that the study is safe and effective for anyone who will be in the study. It is also the IRB's responsibility to ensure that the study adheres to the FDA's regulations.

The IRB is responsible for: (a) Making sure the risks are as low as possible and that the risks are worth the benefits, and (b) Making sure all federal, institutional, and ethical guidelines are followed.

The IRB must review and approve components of a study including: (a) the protocol, (b) informed consent forms, (c) study advertisements/recruitment materials, and (d) informative handouts (i.e. fact sheets or brochures).

Intermediate Clinical Endpoint (ICE)
A measure of a therapeutic effect that is considered reasonably likely to predict the clinical benefit of a drug.

Investigational New Drug (IND)
A drug that has not been approved for general use by the FDA, but is being studied in clinical trials to study its safety and effectiveness. The IND program at FDA is how a pharmaceutical company obtains permission to ship an experimental drug across state lines (usually to clinical investigators) before the drug has been approved. The FDA reviews the IND application for safety to assure that research subjects will not be subjected to unreasonable risk. If the application is cleared (accepted), the candidate drug usually enters a Phase 1 clinical trial.

Mutation
A change in genetic material. Mutations can be passed down through families or can occur by accident in a person for the first time. A mutation changes how that gene is supposed to work.

Natural History Study
A study that follows a group of patients over time who have, or are at risk of developing, a specific medical condition or disease. A natural history study collects health information in order to understand how the medical condition or disease naturally develops and progresses.

New Drug Application (NDA)
The compiling of all non-clinical, clinical, pharmacological, pharmacokinetic, and stability information required about a drug by the FDA in order to approve the drug for marketing in the U.S.

Open Label Study
Everyone involved (i.e. people, doctors, pharmacists) in the trial know which people have been assigned which treatment group.

Outcome Measure
A test that is used to objectively determine the function of a patient. Common outcome measures in Duchenne are the 6-minute walk test (6MWT), North Star Ambulatory Assessment (NSAA), and 10-meter walk/run. Non-ambulatory measures include reachable workspace and performance of upper limb (PUL).

Patient Reported Outcome (PRO)
Any report about a person and their health that comes directly from the person, without interpretation of that information by a clinician or anyone else. Examples include the surveys on DuchenneConnect that ask about symptoms, mobility, and quality of life.

Pharmacokinetics (PK)
The study of how a drug is processed, metabolized, and gotten rid of from the body.

Phenotype
Traits or characteristics that are observational such as brown hair or eye color. The phenotype is determined by a person's genetic makeup, or genotype. In Duchenne, a phenotype trait could be scoliosis as it is an observable trait.

Placebo
An inactive treatment, such as a pill, that makes the group think they are receiving the new treatment.

Pre-IND Meeting
Sponsors looking for pre-IND guidance can request a "Type B" meeting with the FDA. This is an opportunity for a company to gain valuable feedback from the FDA on any questions regarding drug development. Although the FDA does not require these meetings, they are recommended because such meetings can confirm the requirements of the development process.

Primary Endpoint
The main event or outcome that is being used to determine if the therapy or treatment actually works.

Protocol (or Study Protocol)
The written description of a clinical study. It includes the study's objectives, design, endpoints (or what is being measured), methods, inclusion, and exclusion criteria (who can participate).

Protocol Amendment
A written description of a change(s) to a protocol.

Secondary Endpoints
Secondary endpoints are only used to help interpret the primary endpoint, but they cannot be used by themselves to prove a therapy or treatment is effective. Secondary endpoints may also help provide information about future research.

Serious Adverse Event (SAE)
An event in a study that includes any of the following: (a) in-patient hospitalization or prolonging of a hospital stay, (b) significant disability, (c) death or life threatening event, (d) requires treatment to prevent permanent damage, or (e) results in a birth defect.

Single Blind Study
Either the researcher or the person in the study do not know which treatment group the person has been given.

Sponsor
The group, company, or individual who is paying for the clinical research. Sponsors include individual researchers, foundations, voluntary groups, health care institutions, government agencies, as well as pharmaceutical, biotechnology, and medical devices companies.

Surrogate Endpoint
In clinical trials, a surrogate endpoint is an indicator or sign used in place of another to tell if a treatment works. Surrogate endpoints do not guarantee that a treatment works, but they can give an earlier indication that the therapy is reasonably likely to have benefit. Biomarkers can be used as surrogate endpoints (see biomarkers). In cancer, surrogate endpoints include a shrinking tumor. In Duchenne, though not yet validated, dystrophin levels or MRI imaging of muscle are exploratory surrogate endpoints.

X-linked disorder
The gene for the disease is located on the X chromosome. Males have one X chromosome and one Y chromosome. Females have two X chromosomes.

ACRONYMS

- **NIH** – National Institutes of Health
- **CDC** – Centers for Disease Control
- **FDA** – Food and Drug Administration
- **HHS** – Department of Health and Human Services
- **NINDS** – National Institute of Neurological Disorders and Stroke
- **NIAMS** – National Institute of Arthritis and Musculoskeletal and Skin Diseases
- **NCATS** – National Center for Advancing Translational Sciences

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