Myolex® mScan® to speed clinical trials in conditions affecting nerve and muscle, from Q3'20 and beyond

A positive clinical therapeutic trial requires both a meaningful therapy and a means of measuring its effect. In the field of neuromuscular disorders, which includes amyotrophic lateral sclerosis, muscular dystrophies, and any condition that negatively impacts muscle health, standard means for assessing effect has been clinical outcomes measures, such as strength assessments, walking distance over a 6-minute period, or the completion of a questionnaire. More recently, there has been a strong interest in using quantitative biomarkers of disease activity and progression in lieu of these clinical outcome measures, since biomarkers do not rely on a patient's level of effort or mood. Whereas the term "biomarker" was originally used to describe a blood-based assay, it is now used more broadly to include imaging and other technologies, including MRI and electrophysiologic methods.

Electrical impedance myography (EIM) is a relatively new technology based on the older concept of bioelectrical impedance analysis.[1] Whereas many standard bioimpedance approaches utilize electrodes spaced across the body (e.g., placed on the hand and foot), in EIM, the electrodes are placed on a specific location over a muscle or muscle group of interest. A weak electrical current is passed through the tissue across a wide range of frequencies through one set of electrodes and the resulting voltages are measured via a second set. Alterations in the health of the muscle are reflected in the measured voltages. For example, atrophying muscle fibers or muscle containing excess connective tissue or fat will show very different values than muscle which is healthy. Moreover, "super-healthy" muscle (e.g., related to muscle strengthening or hypertrophy) will show above-average values in EIM as well.

Unlike functional measures, the mScan does not rely on patient effort or motivation, and unlike other technologies, such as MRI, it does not require detailed image analysis or expensive and large capital equipment. Moreover, the operation is extremely quick and entirely painless. The application takes only seconds to study a single muscle, and can be performed in the office or by the bedside at home.

Benefits of Myolex® mScan® System for clinical trial
Reduce clinical trial cost, complexity and time
Improve clinical trial efficiency
Provide superb quantitation of treatment effect
Readily accepted by study personnel given ease-of-use
Easy data access via cloud-based data management
High-level analytics using machine learning
Proven EIM technology applied in clinical trials

The Myolex® mScan® (Figure 1) is the first (pending FDA Clearance) device to utilize EIM. The mScan has a number of features that make it a natural fit for use in clinical trials. Indeed, helping to ensure the success of your clinical trial is one of Myolex's specific goals and is included in the company's mission statement. The product includes a rechargeable handheld device for actual measurement, a patent-pending disposable hydrophilic salt-solution embedded electrode array (in sealed packaging) and a unique APP installed on a new iPad, which displays recorded data and can provide a "heat map" of muscle health across the body. The system is tethered to the cloud where sophisticated algorithms employing machine-learning and artificial intelligence approaches are applied to extract the full value from the complex impedance data set (and can make use of the learning from our past EIM devices with over 10 million measurements recorded prior to 2020).

Figure 1. mScan device, iPad with app, and disposable hydrophilic foam electrode arrays

Since it requires relatively little technical expertise to get high-quality data, it offers substantial flexibility in terms of its implementation. For example, one can study a single body region which is most affected by disease. In the case of amyotrophic lateral sclerosis, this could be a single limb that is most rapidly progressing from the disease rather than adopting a far less sensitive assessment of whole-body decline. In the case of a myopathic condition, it can mean measuring trunk muscles or proximal

muscles not typically assessed using standing imaging approaches. By performing such directed measurements, it becomes possible to detect a treatment effect over shorter periods of time and with fewer patients, helping to facilitate and speed the completion of clinical trials. Figure 2 shows an example of sample size improvements by using mScan technology from two recent studies, one in ALS[2] and one in Duchenne muscular dystrophy[3].

Myolex® mScan® Device Benefits
Fast, taking only seconds to perform
Requires minimal training
Can even be performed by patient or caregiver, in their home
Painless, Quick, and Easy to do
No detailed image analysis required
Can survey many muscles, even on the trunk
Safe and effective method for gathering muscle health data

As the technology is especially easy to apply, it can even be taught to be performed by caregivers or even by the patients themselves. This means that the technology can be applied at home on a more frequent basis (e.g., weekly or even daily)—far more frequently than is possible using standard approaches for muscle assessment in which a patient needs to visit a hospital or other clinical center for expensive, lengthy, and infrequent measures. By performing frequent measurements with this technology, it becomes possible to more accurately detect treatment effects than by doing only occasional measurements. In fact, it becomes possible to reduce sample size by more than 5-fold using this at home approach.[4] The mScan system, in addition to a dedicated clinician app, also has a single-user app. Both of these automatically upload data to the cloud into a user-friendly, web-accessible database.

The mScan device, is portable, lightweight, and easy to use. It can even be done by the patient at home during a Pandemic or a snowstorm, etc, thus reducing risk of timely data gathering as well. In summary, EIM technology, as delivered through the Myolex® mScan®, offers to greatly improve the efficiency of many clinical trials, by reducing cost, complexity, length of study, and the number of individuals needing to be recruited for a clinical trial in any disorder that impacts muscle. Utilizing the mScan device in a relevant clinical trial, can have a huge ROI benefit for the Pharma company involved.

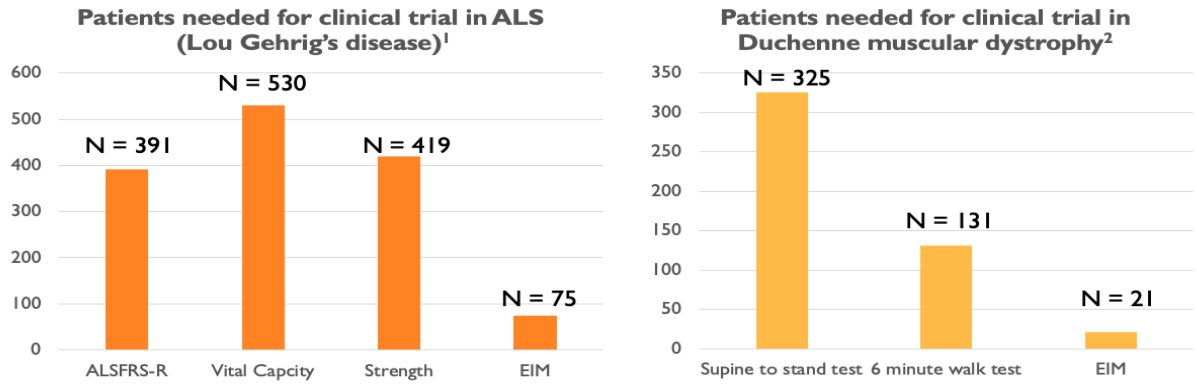

Figure 2. Sample size needed for a clinical trial in ALS using various modalities (left) and for Duchenne muscular dystrophy (right), based on two recent clinical trials. EIM shows dramatic reductions in sample size requirements compared to standard approaches.

References:

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3. Rutkove SB, Kapur K, Zaidman CM, Wu JS, Pasternak A, Madabusi L, *et al.* Electrical impedance myography for assessment of Duchenne muscular dystrophy. Annals of Neurology 2017; **81**:622–632.
4. Rutkove SB, Narayanaswami P, Berisha V, Liss J, Hahn S, Shelton K, *et al.* Improved ALS clinical trials through frequent at-home self-assessment: a proof of concept study. Annals of Clinical and Translational Neurology 2020; **n/a**.