

# Exercise is Medicine

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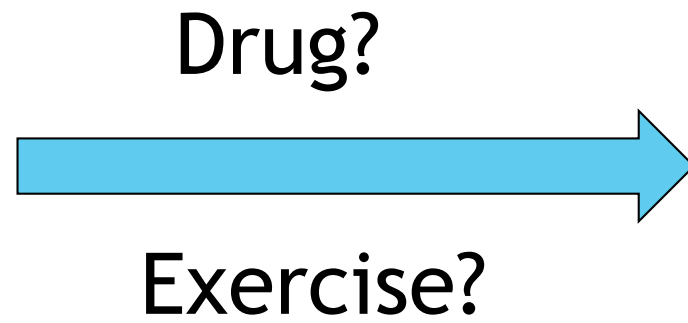
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# Intervention



# Exercise as Medicine

- ▶ Everyone claims to do so
- ▶ Not really done in practice
- ▶ Practical difficulties
- ▶ Misunderstood by both patients and providers

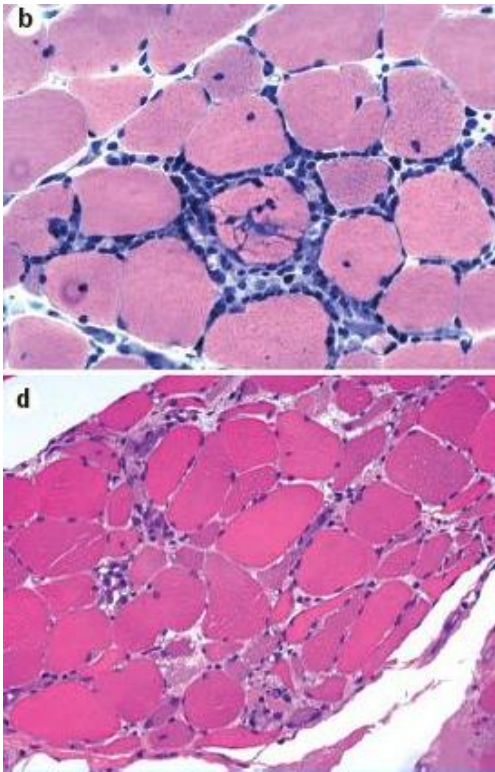


# Misconceptions

- ▶ Exercise is good for ANYTHING
- ▶ Exercise is bad if you have a muscle disease
- ▶ Exercise is important, but NOT as important as real drugs
- ▶ There is nothing scientific about exercise - it just works!
- ▶ This is NOT a medical intervention - you don't need to see a specialist, just go to a gym!



# Exercise as a Medical Intervention



- ▶ Is exercise always good or bad when you have a muscle disease?
- ▶ There are different kinds of exercise: endurance, cardiovascular, resistance, etc.
- ▶ Each exercise has very specific goals
- ▶ There are different “dosing” for exercise

# Imagine...

- ▶ You have a diabetes and your doctor wrote a prescription like this...

For \_\_\_\_\_  
Address \_\_\_\_\_ Date \_\_\_\_\_

**R<sub>x</sub>**

*Diabetes drugs, ask  
pharmacist to evaluate and  
treat*

REFILL \_\_\_\_\_ TIMES \_\_\_\_\_, M.D.  
DEA NO. \_\_\_\_\_ Address \_\_\_\_\_



# In Reality

- ▶ This is very common, and completely accepted

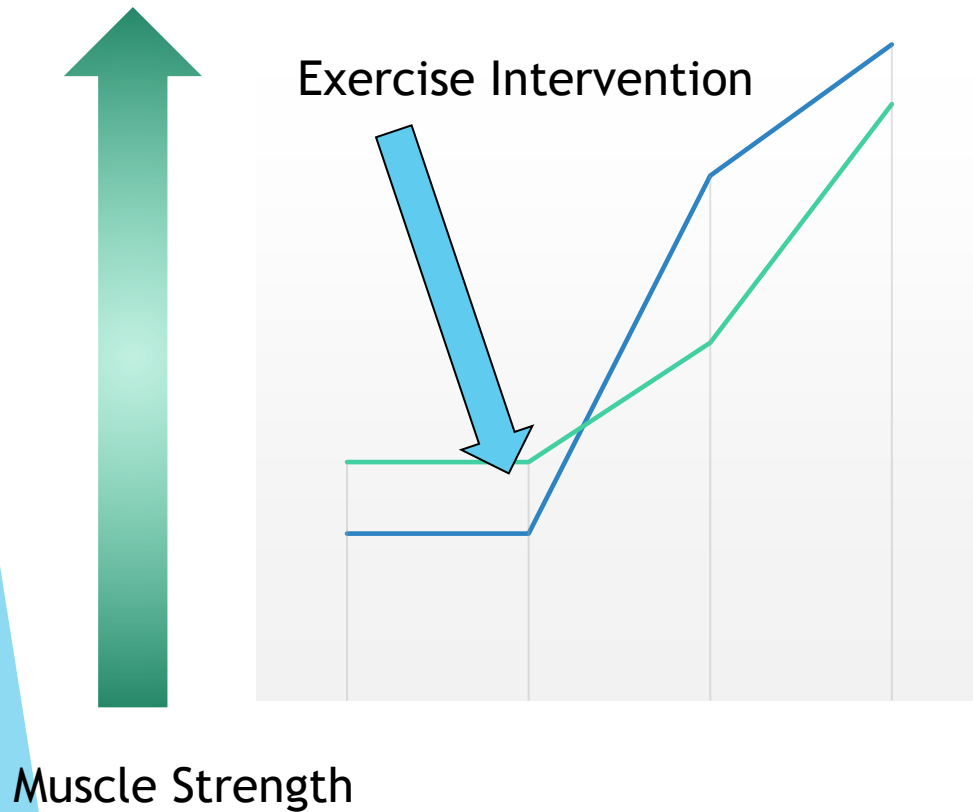
For \_\_\_\_\_  
Address \_\_\_\_\_ Date \_\_\_\_\_

**R<sub>x</sub>**

*Physical Therapy, therapist to  
evaluate and treat*

REFILL \_\_\_\_\_ TIMES \_\_\_\_\_, M.D.  
DEA NO. \_\_\_\_\_ Address \_\_\_\_\_

# What Are Needed to Prescribe Exercise?



- ▶ Accurate and objective measure of muscle strength
- ▶ Types of exercise should be well defined
- ▶ Standardized way of “dosing” the amount of exercise







# How to Measure Muscle Strength?

- ▶ Not as easy as you think!
- ▶ Different “kinds” of muscle strength: endurance, resistance, isometric, isokinetic, etc.
- ▶ Normal vs. Abnormal?



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## For Myositis

- ▶ Functional Index (FI)-2 was developed to accurately measure endurance quality of myositis
- ▶ FI-2 is standardized and quantifiable
- ▶ In our clinic, we also use other standardized measures (such as grip strength, 6-minute walk test, etc.)



# Types of Exercise

- ▶ **Cardiovascular:** the goal is to improve cardiovascular function (outcome: “VO2max” or heart rate)
- ▶ **Endurance:** the goal is to increase repetition
- ▶ **Resistance:** the goal is to increase the weight
- ▶ **Balance**
- ▶ **Flexibility (stretching)**





# How Do We “Dose” Exercise?

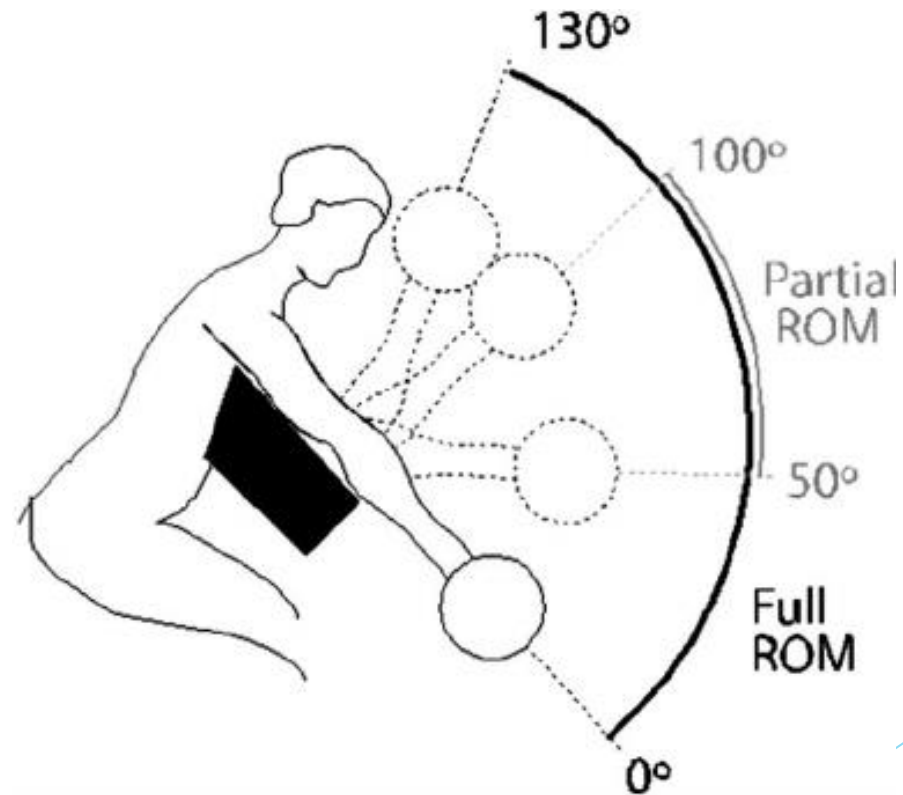
- ▶ Exercise can be “dosed” just like drugs
- ▶ The problem is some are much stronger than others at baseline
- ▶ Then how can you determine what’s “too much” for one, and “too easy” for another?



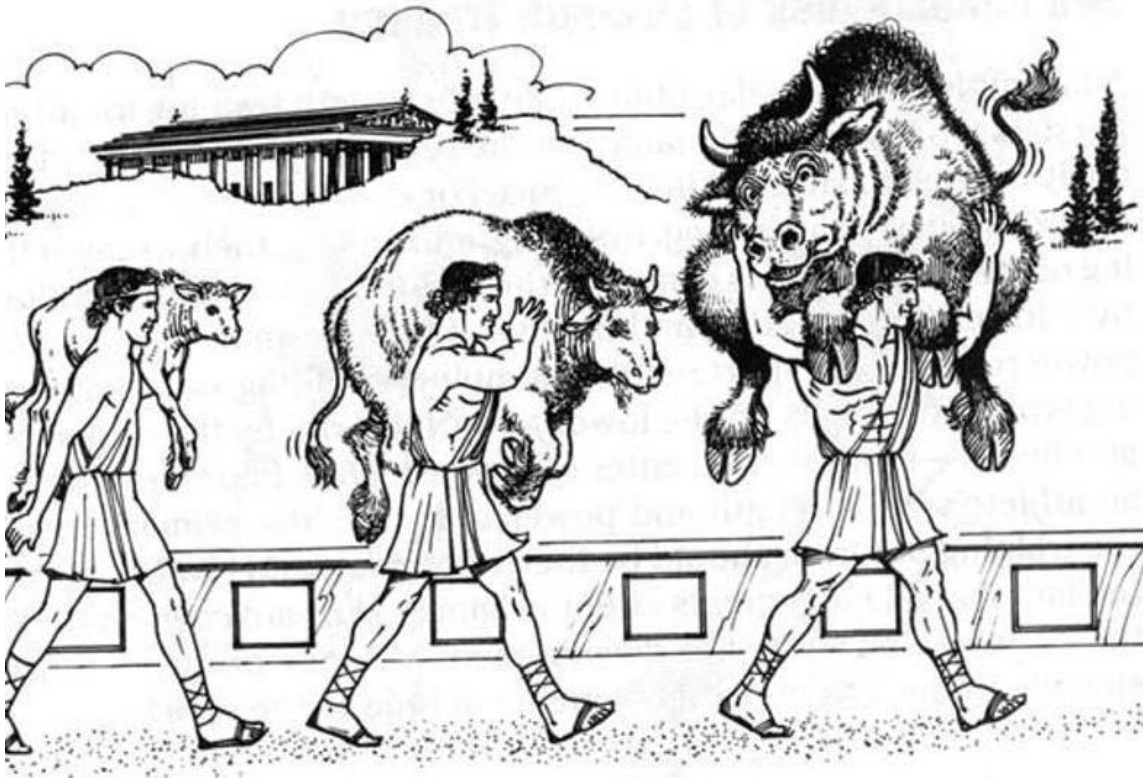
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# Repetition Maximum (RM)

- ▶ **One RM:** the most weight that can be lifted throughout the entire range of motion
- ▶ The higher the RM, the lower the weight
- ▶ High intensity, typically < 5 - 10 RM
- ▶ Low intensity or endurance typically > 15 to 20 RM
- ▶ Well validated



# Exercise Needs to Progress!



- ▶ One RM can change over the course of exercise!
- ▶ Need to re-measure RM every 3-4 months



# Myositis and Exercise

- ▶ For a long time, exercise was NOT recommended
- ▶ Over the past decades, the safety of exercise was proven
- ▶ A seminal paper by Alexanderson showed clear benefits of exercise on chronic myositis patients



# Example: Prescription for PM and DM

For \_\_\_\_\_  
Address \_\_\_\_\_ Date \_\_\_\_\_

**R<sub>x</sub>**

*3 sets of 10RM, 3 times a week*

*Re-measure RM every 3-4 months*

*Muscles that are affected (proximal)*

REFILL \_\_\_\_\_ TIMES \_\_\_\_\_, M.D.  
DEA NO. \_\_\_\_\_ Address \_\_\_\_\_



THE MYOSITIS ASSOCIATION



# Concept of Individualization



It doesn't mean that exercise *prescription* can be changed individually

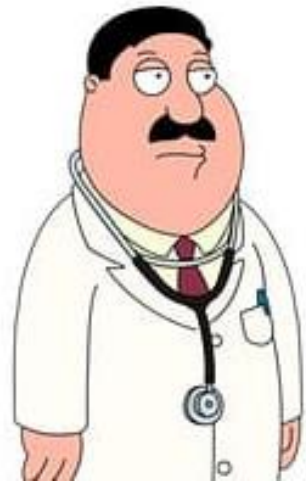


For example, there are many different ways to do 10RM for biceps muscles -> machine vs. free weight, eccentric vs. concentric, etc.

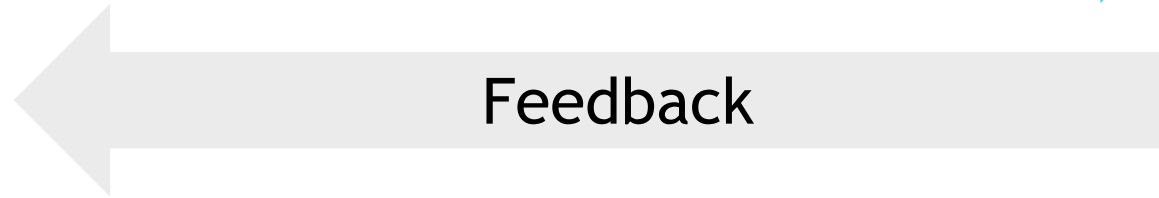


Your therapist should evaluate your overall condition and home environment -> come up with *individualized* plans for exercise

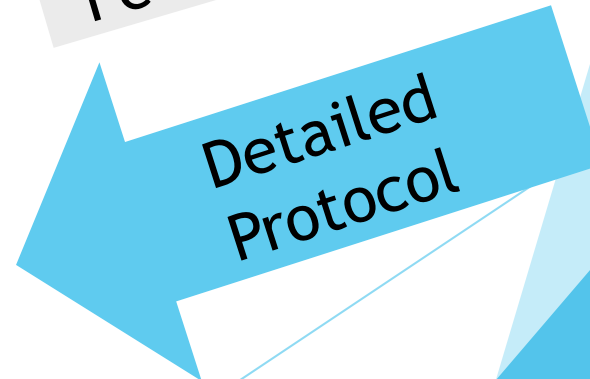
# Ideal Workflow



Doctor



Physical/Occupational  
Therapist



# Difficulties

- ▶ Doctors and Therapists need constant communication
- ▶ Team of MD, PT, OT, and SLP - not always easy!
- ▶ Many patients are from out of state
- ▶ Politics!



# Future Directions

- ▶ Awareness!
- ▶ National and international network through TMA
- ▶ Tele-rehabilitation
- ▶ New technologies





**THE MYOSITIS ASSOCIATION**

# Why do muscles become weak in myositis?

## PM/DM/NM/ASS:

- ▶ Lactate is produced as a product of energy consumption in the muscle (the mitochondria).
- ▶ High lactate levels in blood compared to healthy indicating reduced aerobic capacity of the muscle.
- ▶ Other factors contributing to muscle weakness could be: Lower levels of phosphocreatine in rest and during exercise, lower numbers of capillaries, swollen capillaries expressing pro-inflammatory cytokine interleukin 1.
- ▶ Lower proportion of type 1, aerobic muscle fibers
- ▶ Reduced whole-body aerobic capacity / lung fibrosis - reduced oxygen levels to muscles

## IBM

- ▶ Increased degeneration and reduced regeneration of muscle tissue
  - ▶ Myostatin - a protein preventing muscle growth and regeneration
- ▶ The immune system is involved in combination with the above - needs more investigation
  - ▶ Positivity to NT5C1A antibody is associated with greater disability in IBM

*(Alemo Munters L et al, Curr Rheumatol Rep 2014, Lloyd TE, Curr Opin Rheumatol 2015, Goyal NE J Neurol, Neurosurg, Psychiatry 2016))*



1. Warm-up



2. Shoulder mobility



3. Grip strength



4. Strength knee extensors



5. Strength shoulders



6. Strength hip extensors



8. Strength hip flexors



7. Strength neck flexors and trunk

- About 10 repetitions / task
- Combine with 20 min brisk walks 5 days a week

# 12 weeks home exercise - PM/DM

- ▶ Increase proportion of type I fibers (oxygen dependent, endurance)
- ▶ Could reduce CK-levels, no signs of increased inflammation in muscle
- ▶ Improved muscle strength (if you have pronounced weakness)
- ▶ Improve muscle endurance
- ▶ Improve aerobic capacity (if you add 20 minutes walks 5 days a week)
- ▶ Might reduce fatigue and improve quality of life

*(Alexanderson H et al, J Rheumatol 2014, Dastmalchi M et al, Arthritis Rheum 2007)*





Deltoids



Quadriceps



Lat dorsi/biceps

3 sets of 10 repetitions  
on 10 voluntary repetition  
maximum  
(the weight you can lift  
10times but not 11, 70% of  
Maximal strength)



Gastrocnemius



Trunk/neck

(Alexanderson et al. Arthritis Rheum 2007;57:768-77)

- Start on lower intensity
- Adapt to levels of fatigue, pain, corticosteroid dose, risk of osteoporosis

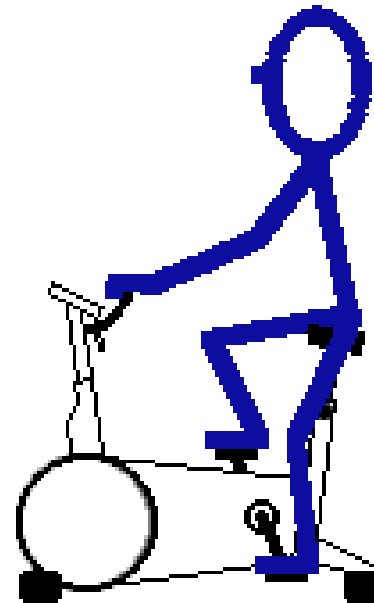
# Reduced disease activity and inflammation

- ▶ 2/8 patients had reduced disease activity according to international criteria
- ▶ Altered gene expression: Genes related to inflammation and fibrosis were down-regulated after exercise compared to before
- ▶ Improved muscle strength (endurance)
- ▶ Some improvement in daily activity performance

*(Nader GA, et al. Mol Med 2010)*

## Aerobic and endurance exercise – low disease activity

- ▶ **Exercise program**
- ▶ 3 times/ w, 12 weeks
- ▶ 30 min cycling (load of 70 % of  $VO_2$  max)
- ▶ 20 min muscle endurance (30-40 % of 1VRM)



# This program can:

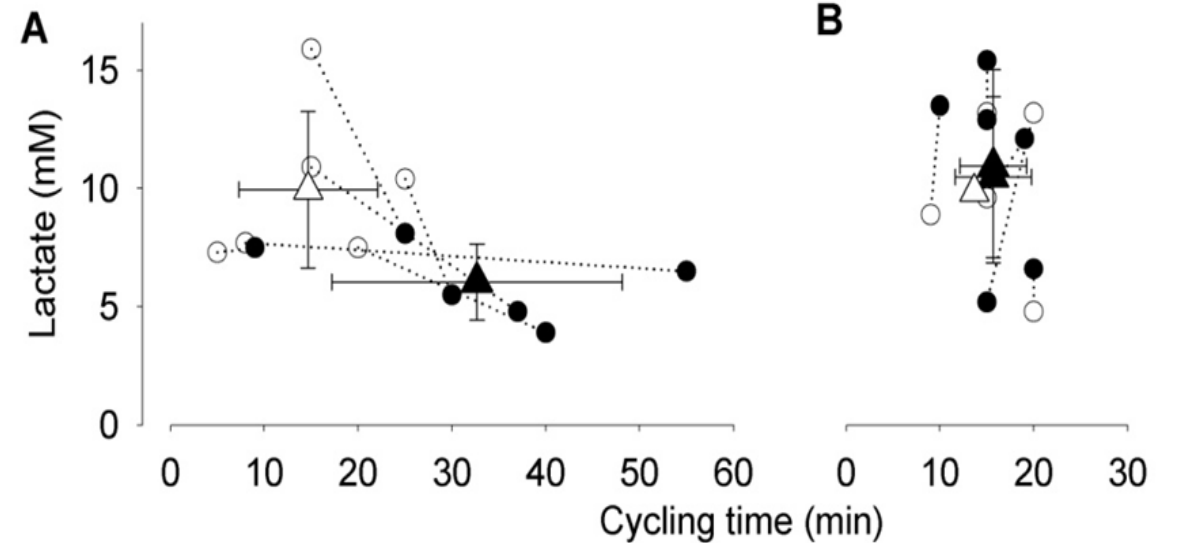
Improve whole-body aerobic capacity

Reduce lactate levels in muscle and improve mitochondria function and increase numbers of capillaries in muscle

Reduce disease activity and inflammation

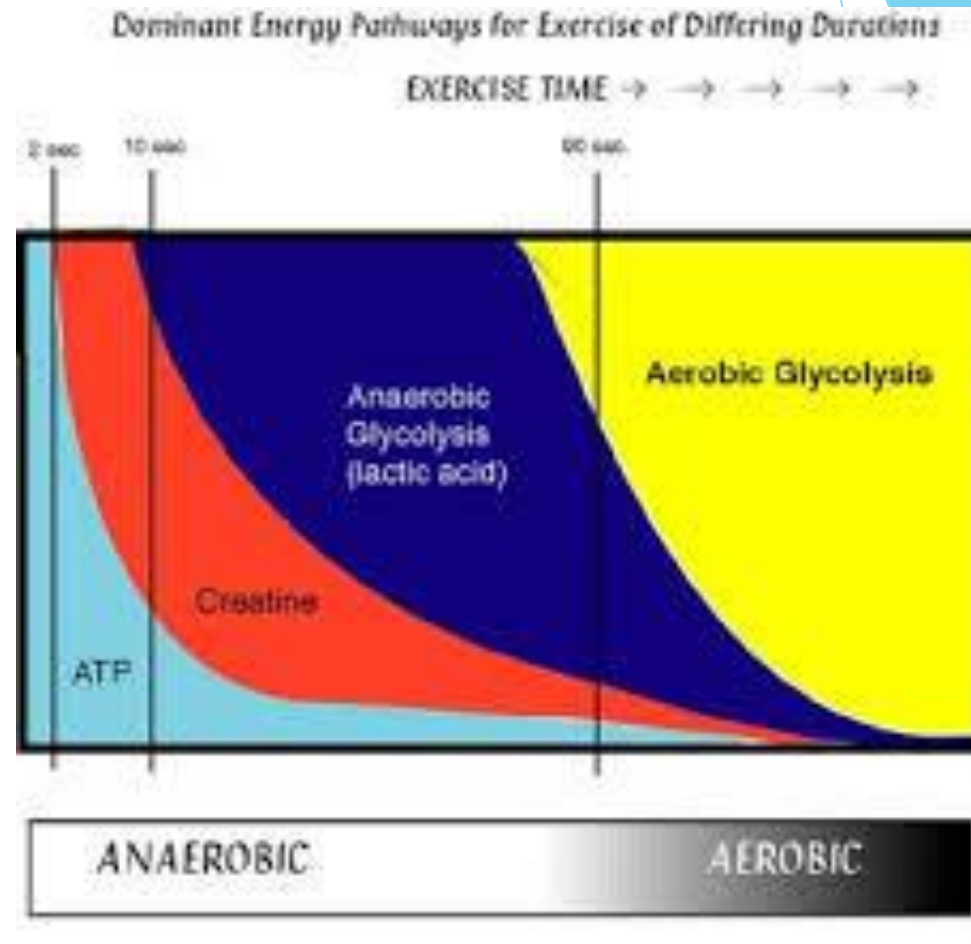
Improve muscle strength and endurance

Reduce fatigue



# Creatine supplementation AND exercise in myositis

- ▶ Phosphocreatine (Pcr) is an important part of the muscle glycolytic (anaerob) metabolism
- ▶ Individuals with DM are reported to have low levels of Pcr
- ▶ Pcr is most important in the muscle energy system during the first seconds of exercise, but is still used to continue muscle contractions up to 2 minutes
- ▶ Five months creatine supplements combined with regular exercise (like home exercise) is more effective than exercise alone in established PM/DM. (Chung YL et al. Arthritis Rheum 2007)
- ▶ Talk to your rheumatologist before starting



# Creatine dose

- ▶ Introduce creatine in addition to 2-3 days a week exercise
  - ▶ Could be any kind of resistance training alone or combined resistance and aerobic exercise
- ▶ Loading dose of 8 grams / day for 3 days
- ▶ Continue with a maintenance dose of 3 grams / day for 3 months
- ▶ Take a 4-week break from creatine and continue to exercise
- ▶ Start again with the maintenance dose for another 3 months and continue this cycle
- ▶ Creatine supplements can **ONLY** have positive effects on muscle function in combination with exercise
- ▶ If you don't exercise regularly - **DON'T** take creatine supplementations!



# IBM

- ▶ Slightly increased (+4.7%) in cross sectional quadriceps muscle fiber area after 12 weeks of blood flow restricted exercise - case report
- ▶ Altered gene expression
  - ▶ Increased expression of muscle growth factor genes after BFR exercise
  - ▶ Decrease in atrogen-1 expression (related to muscle atrophy)

*(Gualano B, et al. Muscle Nerve 2010)*
- ▶ A randomized controlled trial showed that 12 weeks of BRF-exercise led to 5.7% increased quadriceps muscle strength, while the non-exercising control group declined by almost 10%
  - ▶ Sustained strength and function is a positive effect in IBM!
- ▶ Improved self-reported physical function in the BRF-group  
*(Jørgensen A et al. Scand J Rheumatol 2018)*
- ▶ Improved physical function has been induced by other types of exercise, such as 16-week, twice a day home exercise. Molecular changes following this type of exercise has not been investigated *(Johnson LG et al. Neurol Neurosurg Psychaitry 2007)*
- ▶ Exercise does not aggravate disease activity

# Health benefits from regular physical activity

- ▶ Strong association between aerobic capacity and health! Both in healthy and in myositis
- ▶ Regular physical activity and exercise can:
  - ▶ Improve quality of life
  - ▶ Reduce risk of type II diabetes, osteoporosis and cardiovascular disease
  - ▶ Reduce high blood pressure
- ▶ Important as individuals with inflammatory rheumatic diseases are at higher risk of developing cardio-vascular disease





Thank you!  
Questions?