

Wozu KNIMS? Why KNIMS?

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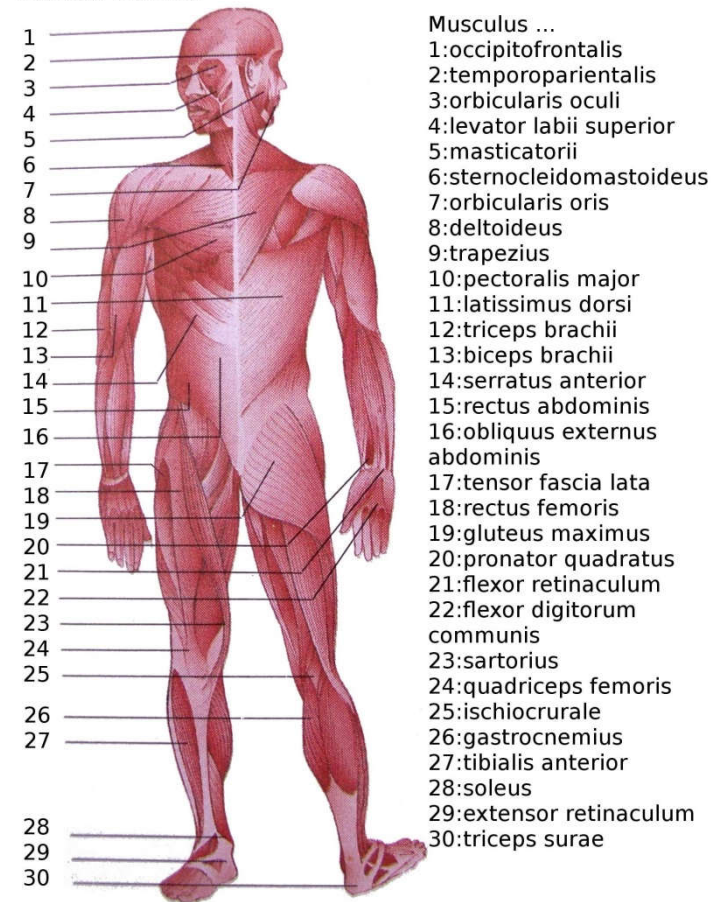


Knowledge for Tomorrow

Skeletal muscle: Our largest organ

- 60% of body mass
- 20% of body's energy metabolism at rest
- Up to 90% of energy metabolism at work

Skeletal muscles

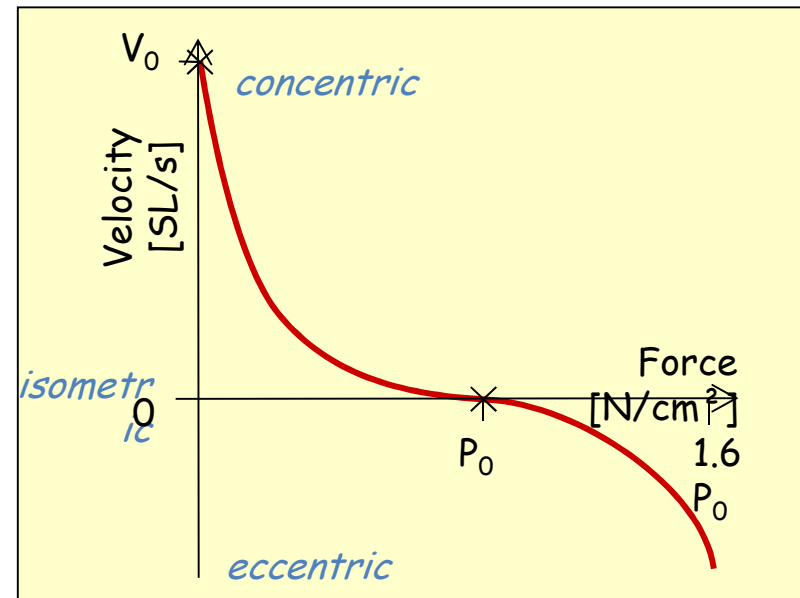


Muscle Functions

- Mechanical Actuator
- Energy dissipation
- Elastic storage (spring)
- Energy consumer
- Secretory organ

Hill's equation:

$$(P + a) \cdot v = b \cdot (P_0 - P)$$



$P_0 \sim 300$ kPa
(or 2400
mmHg)



Sarcolab3: First Results (N=4)

- Substantial soleus muscle atrophy at R+3 despite extensive countermeasure exercise
- No clear-cut tapering-off of loss in muscle strength & pennation angle towards end of mission
- Calf muscle atrophy & weakness negatively related to loading forces during countermeasure exercises
- Local calf muscle atrophy linked to organismic metabolism

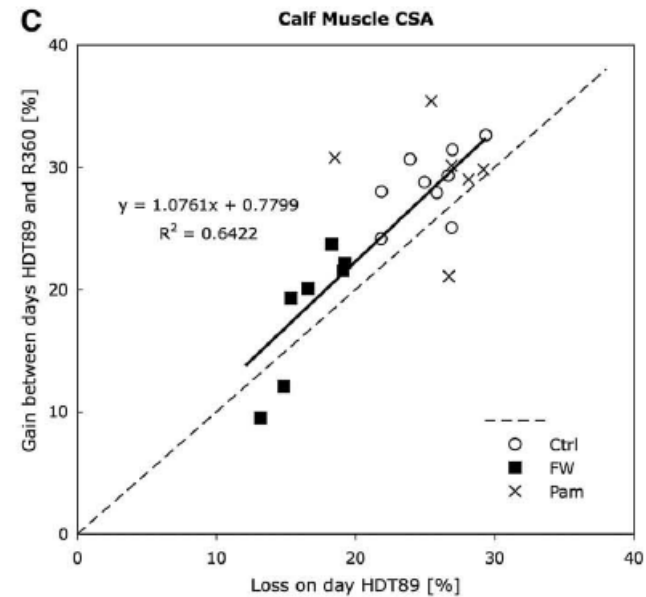
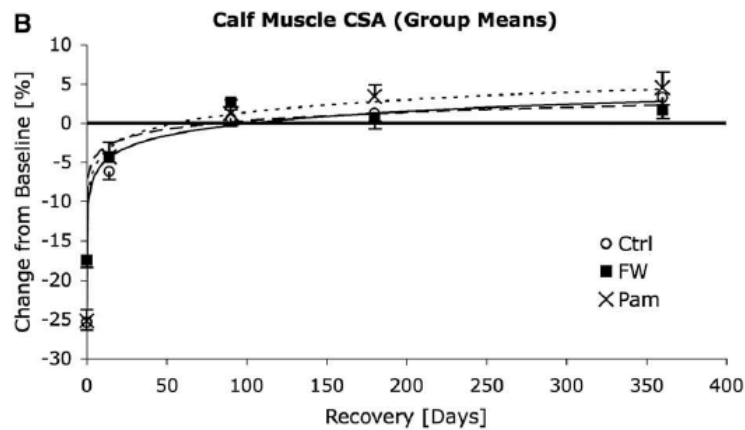
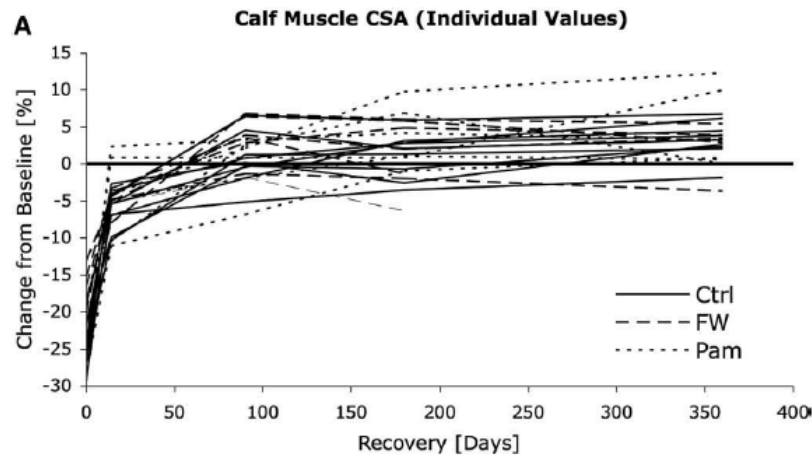
→ Muscle wasting continues to be a problem in space



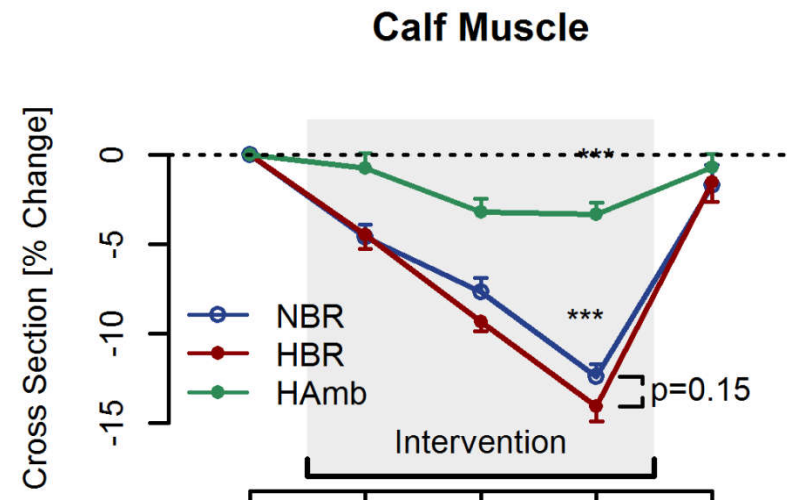
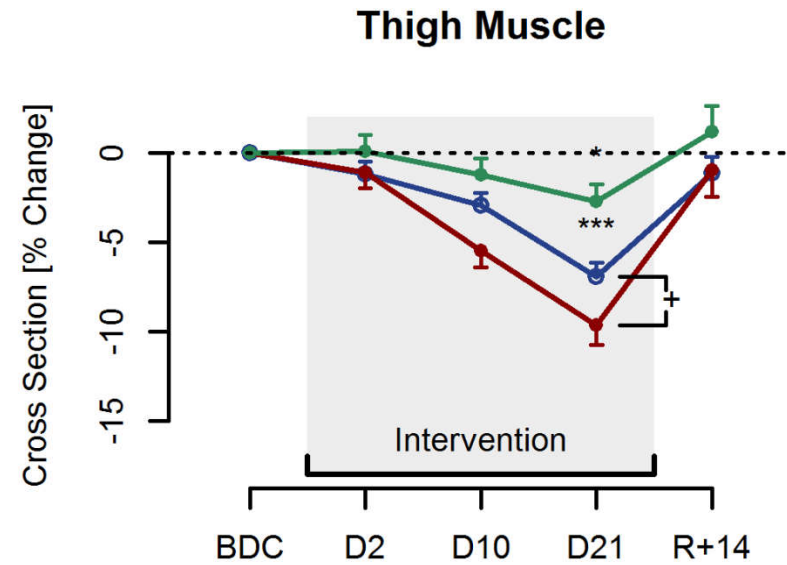
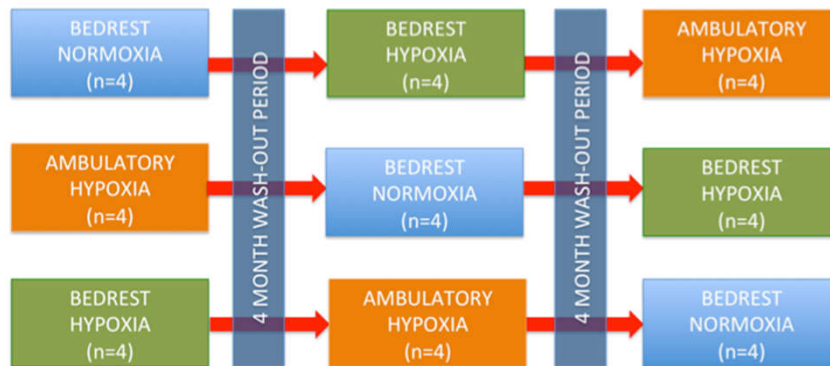
Thomas Pesquet using MARES on ISS



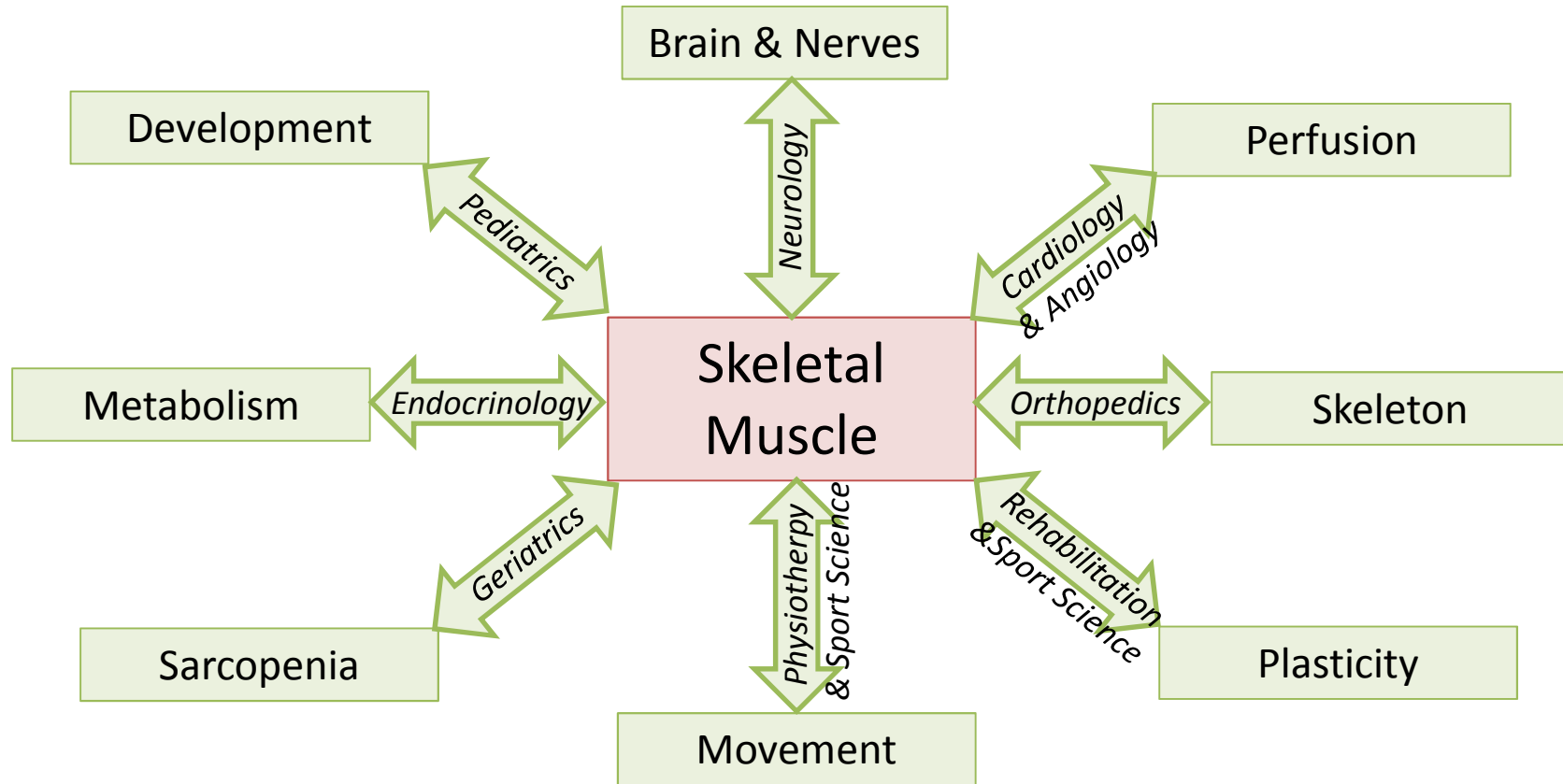
Calf Muscle Size after 90d Bed Rest: 1-Year Follow-Up



PlanHab: Hypoxia aggravates Bed-Rest induced muscle atrophy in the thigh



A ,sarco-centric' view



Getting into Motion – Three important questions to ask

- Diagnostics: How to identify muscle weakness / wasting in an individual?
- Pathophysiology: Which metabolic alterations are caused by muscle wasting?
- Therapy: Which physical and pharmacological options are there?





Ceterum censeo Lunam esse explorandam