Ohio | Bureau of Workers' Compensation

Sit & Stand Ergonomics

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The problem with sitting

Physiology of Inactivity

- Sitting 8-11 hours/day: 15% more likely to die than if sit for fewer hours.
- Sitting > 11 hours/day: 40% more likely to die from any cause.

Physiology of Inactivity

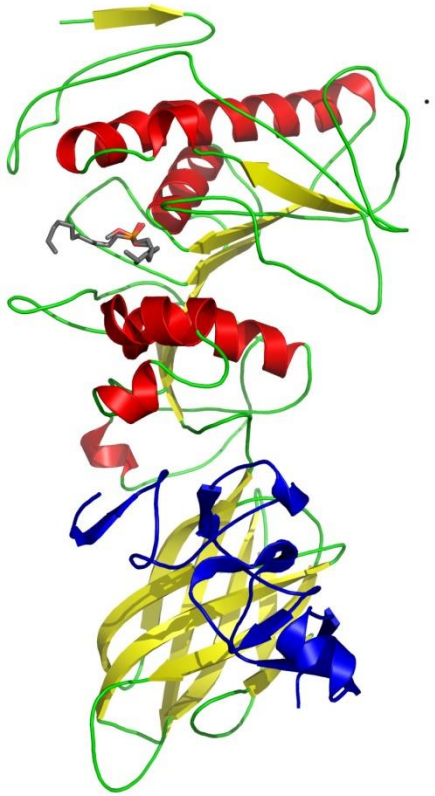
Sitting:
The New Smoking

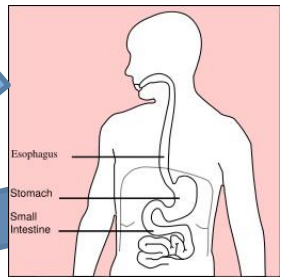
Inactivity Physiology

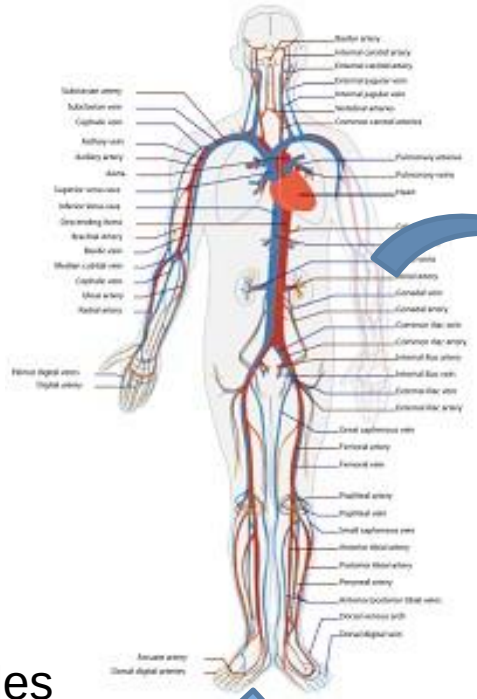
1. Changes in *enzyme* activity
2. Changes in *gene* expression
3. Changes in *glucose* and *insulin*

1. Lipoprotein Lipase (LPL)

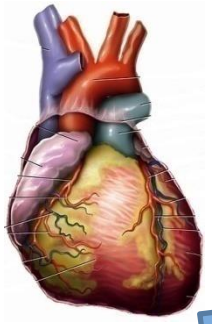
- Water-soluble enzyme
- Breaks down triglycerides (Most common form of fat)
- Affects uptake of triglycerides
- Found in heart, muscle and fat





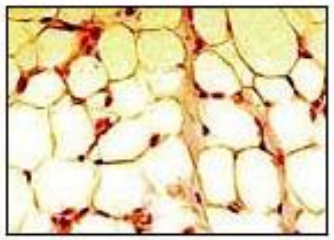


Triglycerides



Inactive skeletal muscles

LPL



Adipose tissue

Heart drawing: www.tiesworks.com

LPL

Affected by *activity* of skeletal muscles

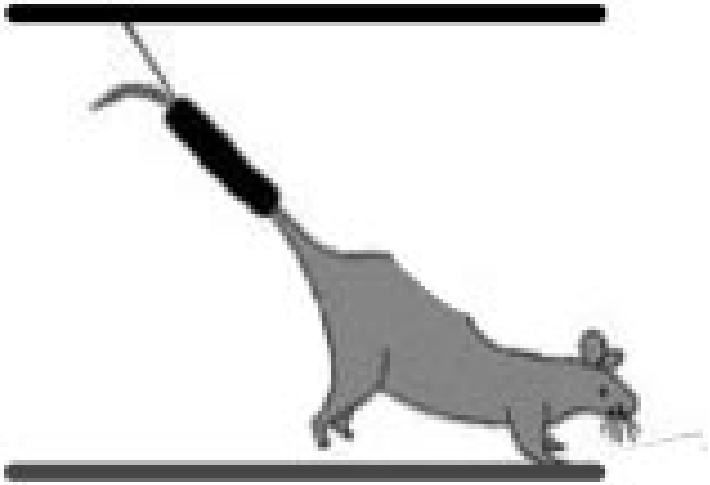
Inactive

- Not moving
- Sitting/lying down
- Little/no contraction in skeletal muscles

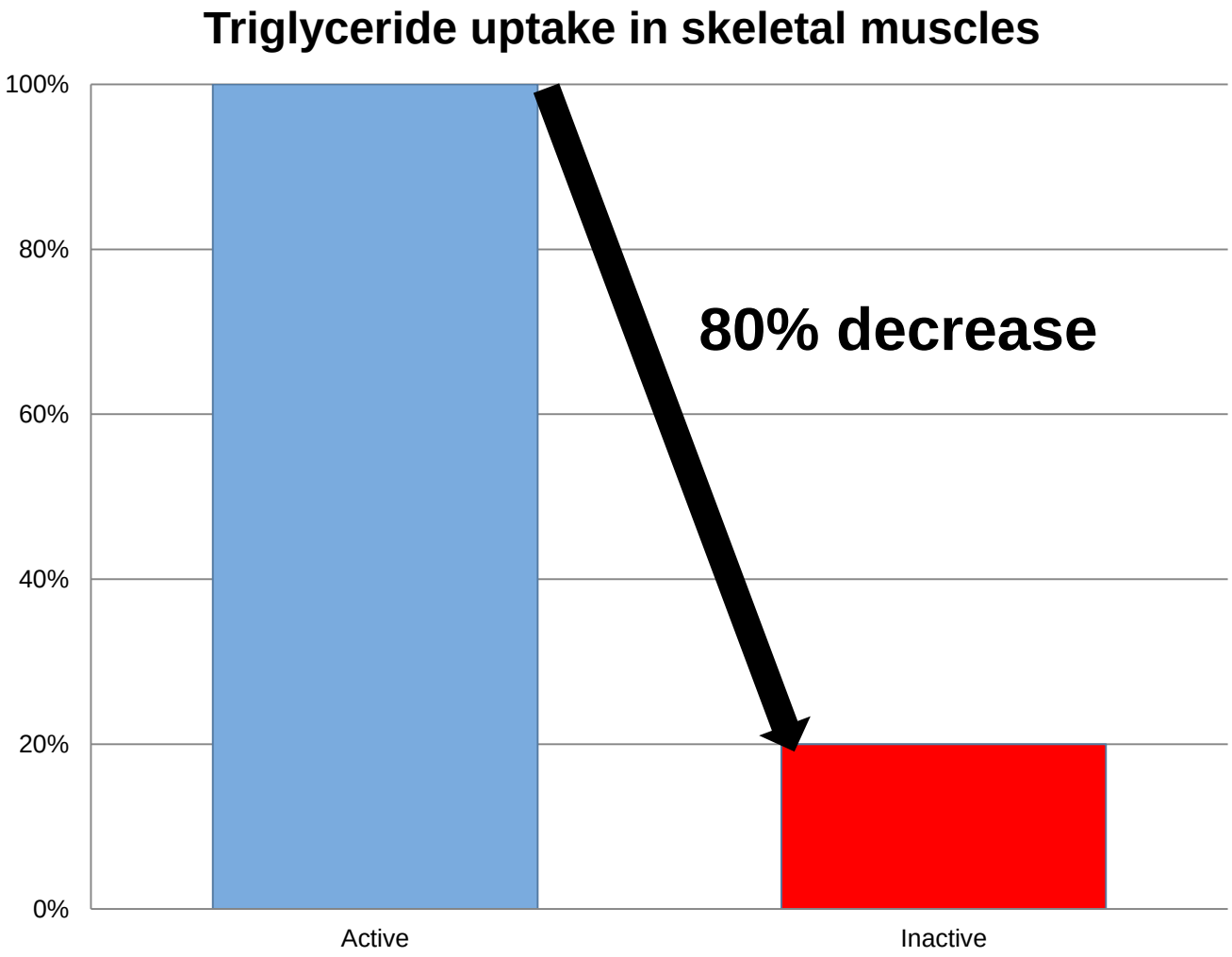
Active

- Moving
- Standing, walking
- Contraction of skeletal muscles
- NOT necessarily “exercise”
- Low-intensity physical activity (LIPA)

Muscle LPL Activity in Rats



Hamilton, MT; Hamilton, DG and Zderic, TW. *Diabetes.* 2007



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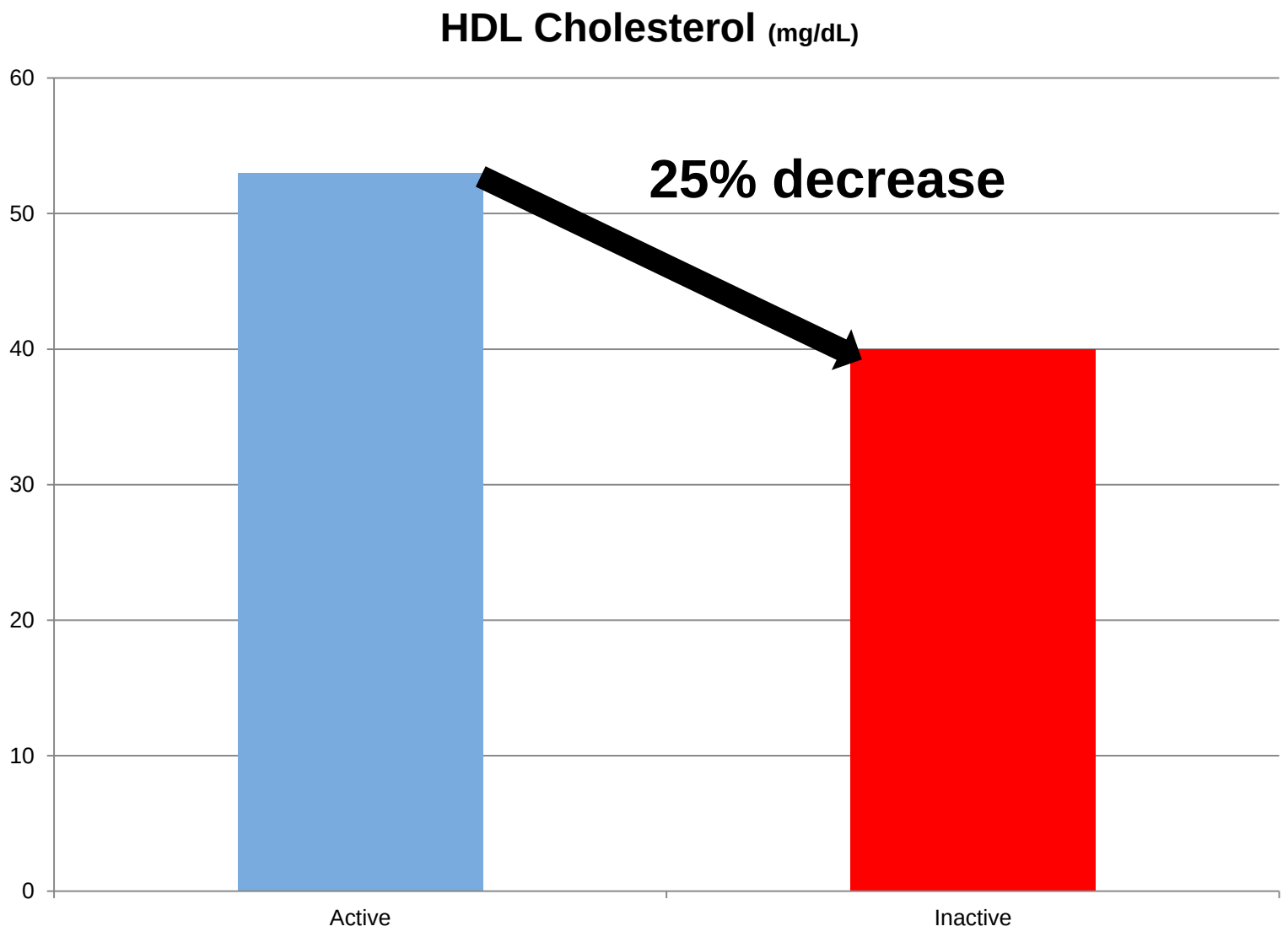

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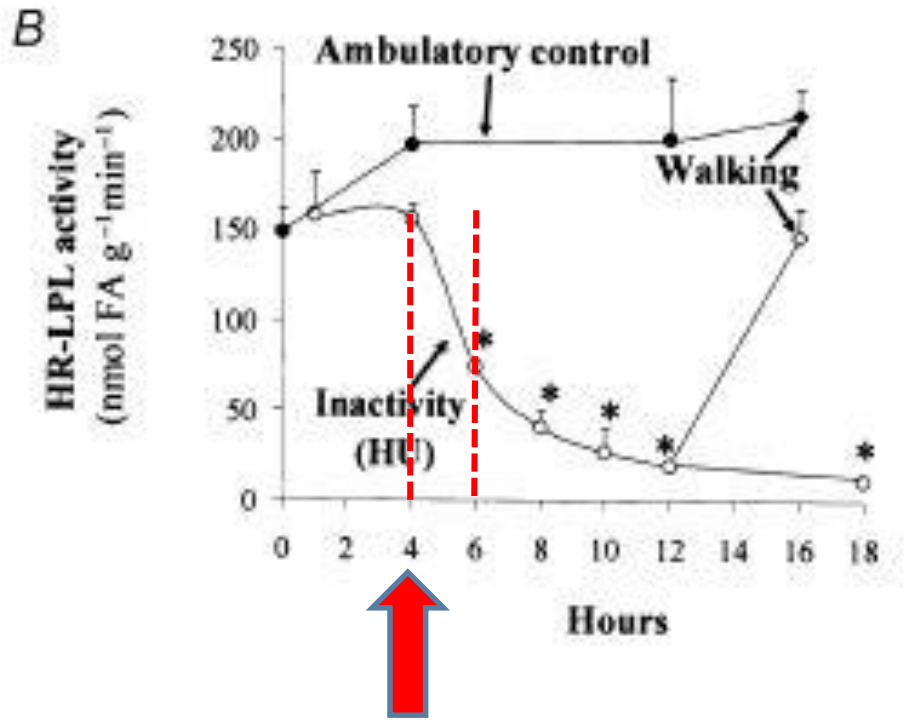


- Decrease begins after four hours of inactivity.
- Steepest drop is between four to six hours.
- LPL activity continues to decrease up to 18 hours.

Hamilton, MT; Hamilton, DG and Zderic, TW. *Diabetes.* 2007

Inactivity Physiology

1. Changes in *enzyme* activity
2. Changes in *gene* expression
3. Changes in *glucose* and *insulin*

2. LPP1 (Gene in Skeletal Muscle)

- One of many genes that regulates blood flow within muscles
- Also involved in blood clotting
- Turned on/off by physical activity/inactivity
- Suppressed after hours of sitting
- Exercise – *not* effective countermeasure

Inactivity and DVT

- Deep Vein Thrombosis (DVT)
- 1/1000 adults at risk for DVT in U.S.

DVT and Pulmonary Embolism

- 60,000 - 100,000 deaths due to DVT/PE (CDC)
- 95% of pulmonary embolism cases caused by DVT

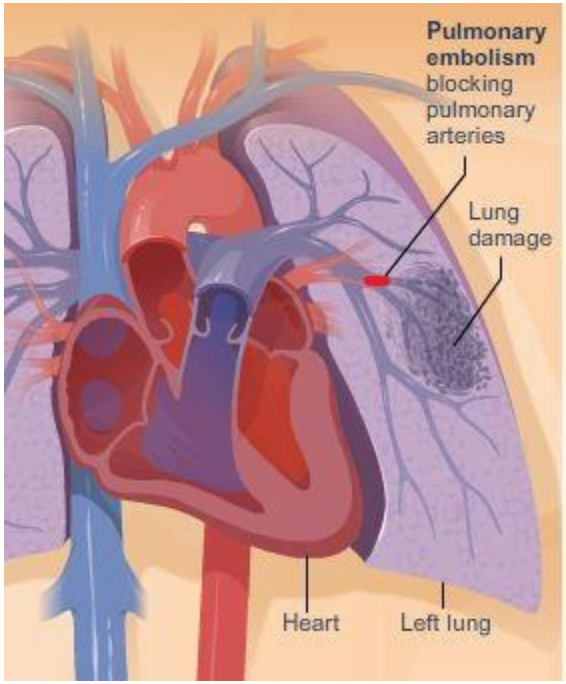
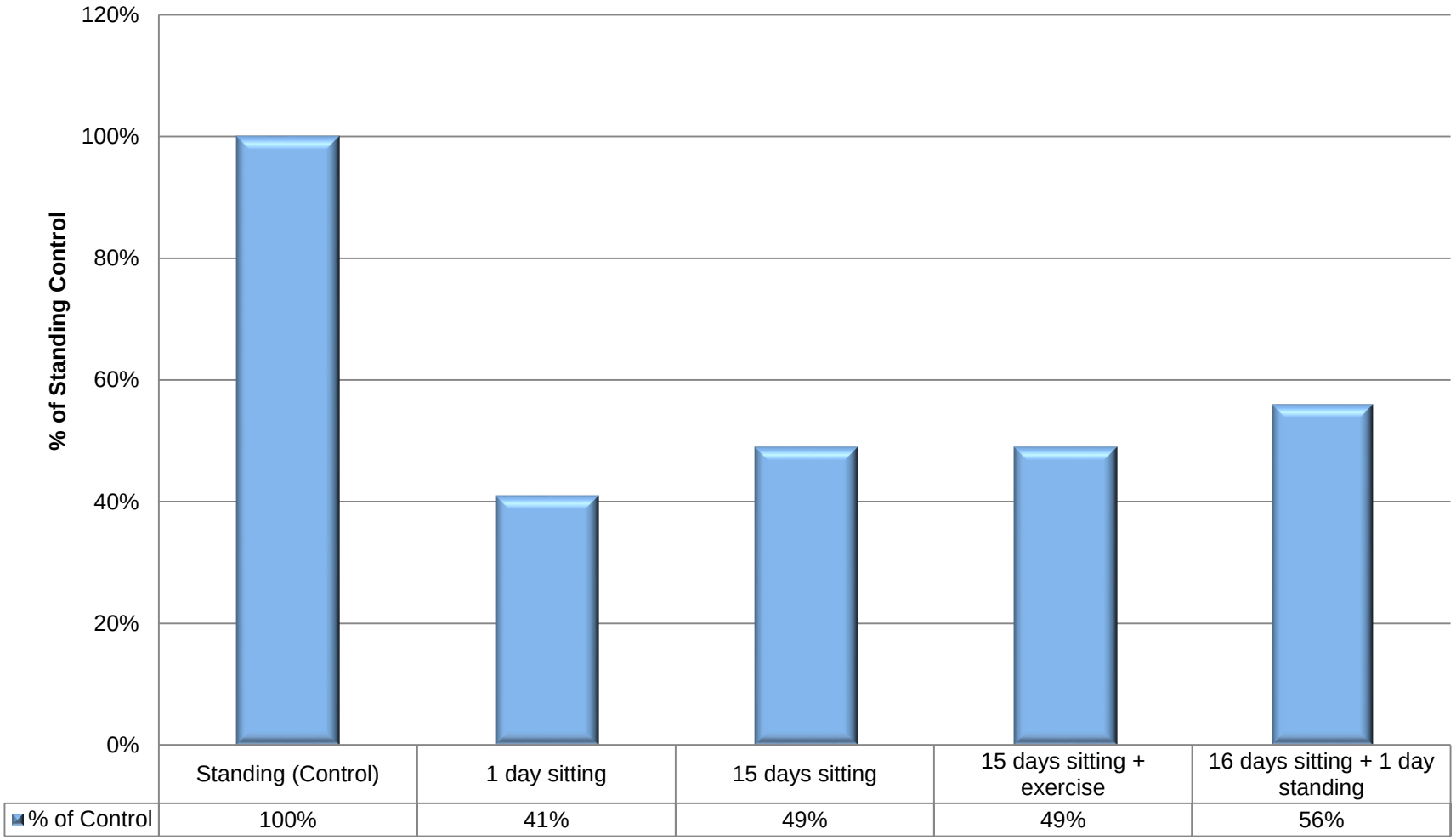


Illustration: NIH

LPP1 expression in human skeletal muscle



Zderic, TW; Hamilton, MT. *Lipids in Health and Disease, 2012*

Inactivity Physiology

1. Changes in *enzyme* activity
2. Changes in *gene* expression
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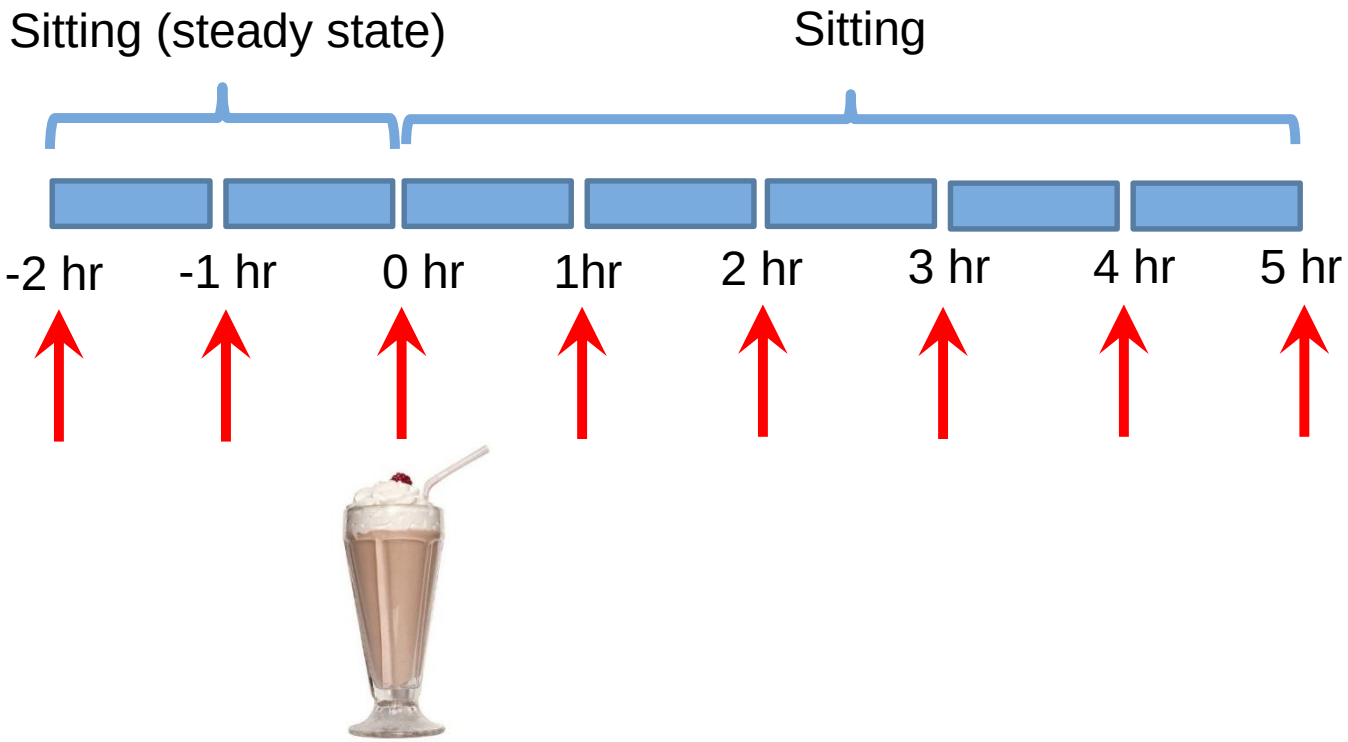
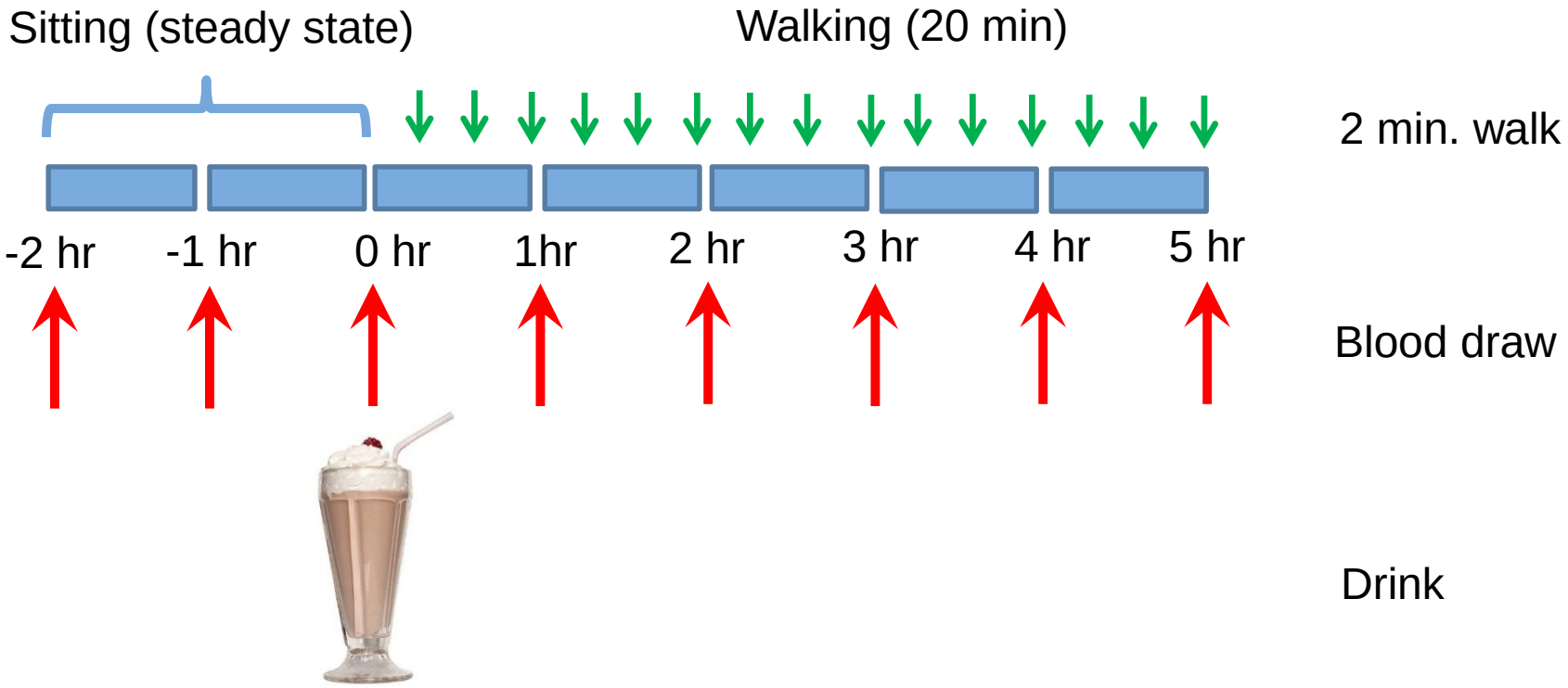
3. Glucose and Insulin

- 19 Adults, 45-65 yrs.
- BMI: >25
- Drink 760 calories
- 3 test conditions:
  - 5 hrs sitting, uninterrupted (control)
  - 5 hrs sitting, 2 min. light walk every 20 min.
  - 5 hrs sitting, 2 min. moderate walk every 20 min.

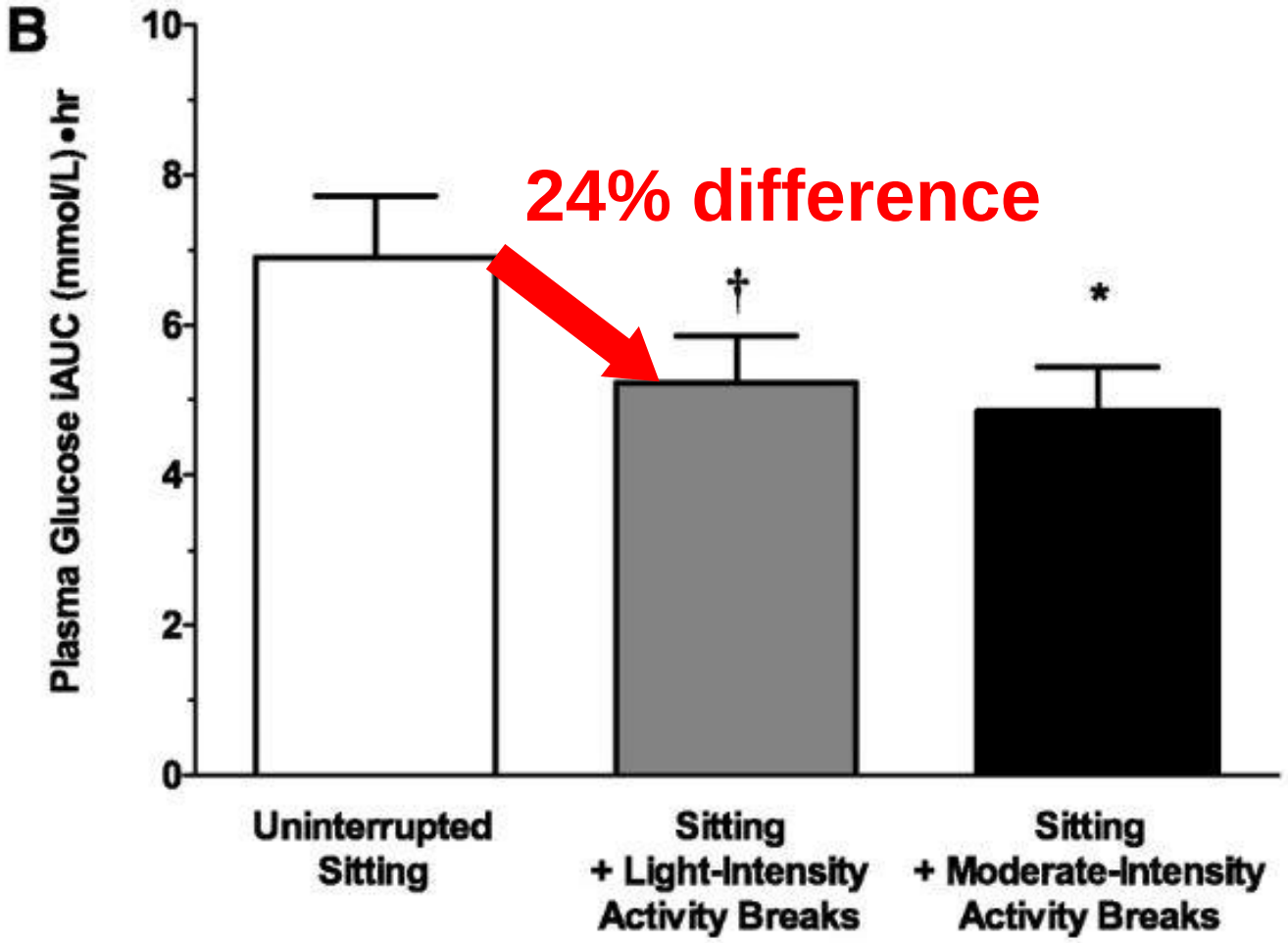
Uninterrupted Sitting



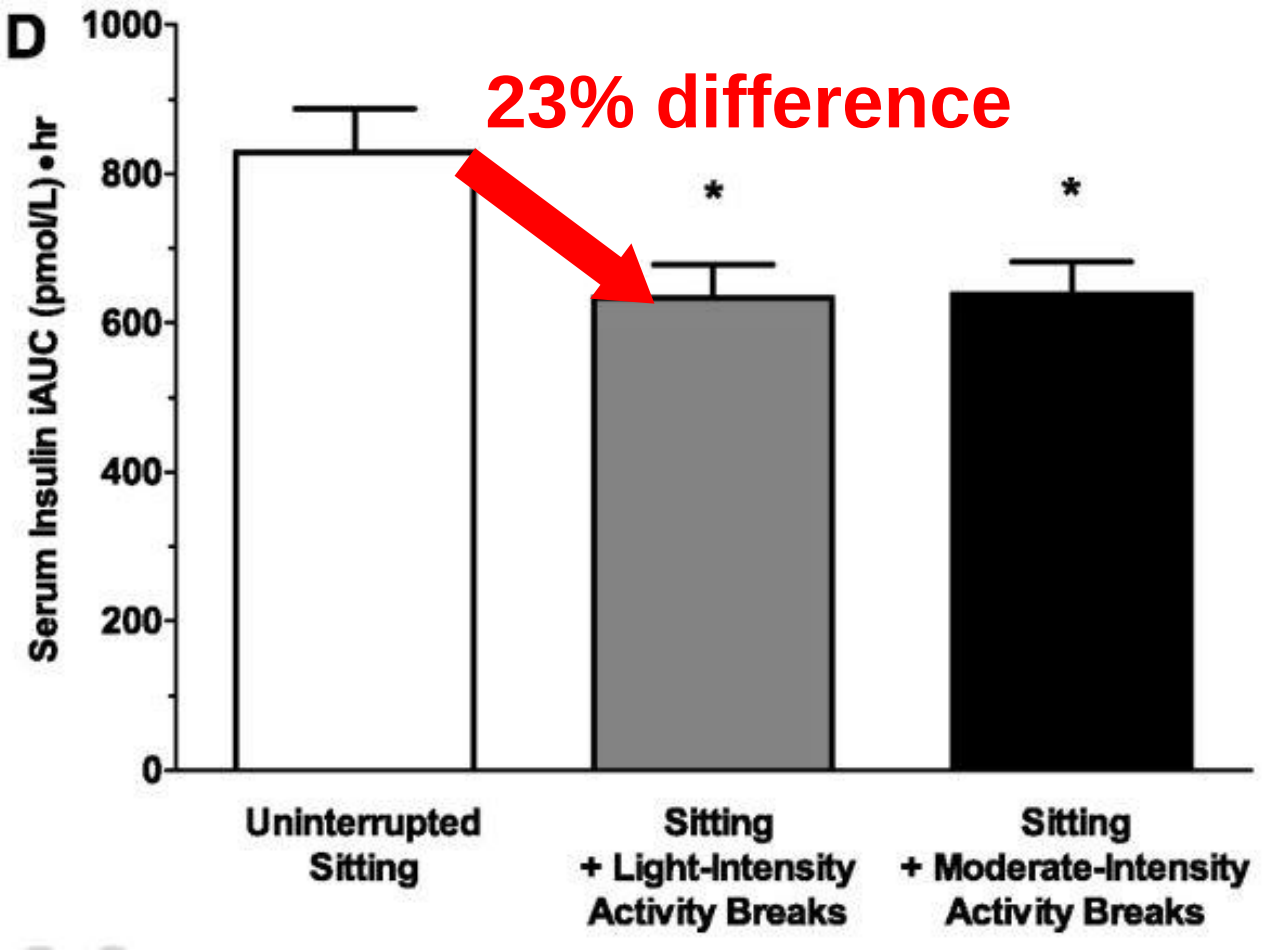
Sitting with Breaks



Glucose Levels



Insulin Levels



The problem with standing

Prolonged Standing

- Feet swell
- Varicose veins
- Back pain
  - Foot rest

What about…

Sit/Stand Desks?

What about…

Treadmill Desks?

What about…

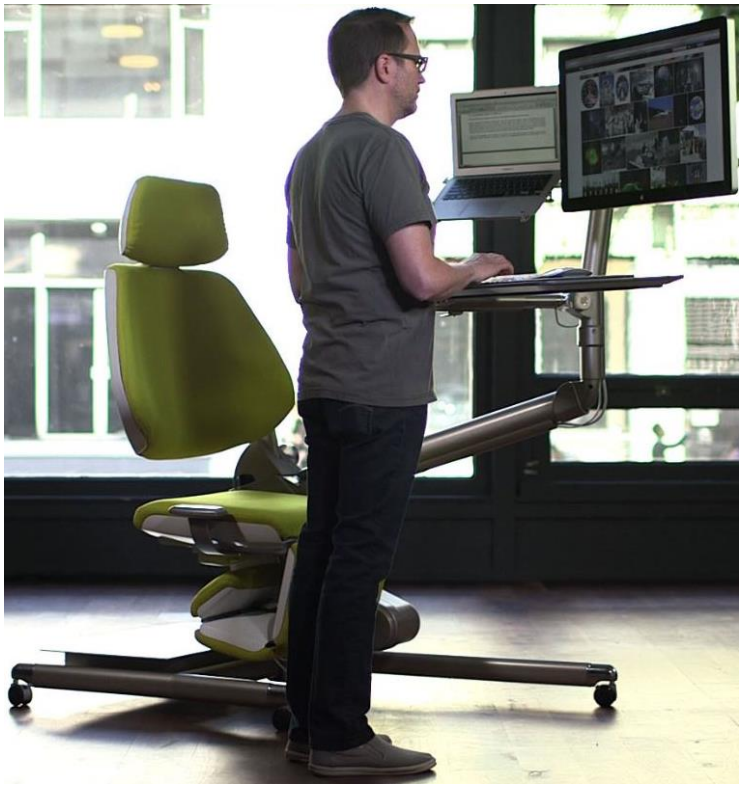
Ball Chairs?

What about…

Reclining Workstations?

What about…

Reclining Workstations?



Moderation is the key

- Avoid *prolonged* sitting or standing
- Walk around slowly but frequently
- A little goes a long way

Suggestions

At Work

- Stand up/walk when on phone (cordless)
- Stand up when reading online (emails, web pages, documents)
- Put printer further away
- Use small water bottles or cups & fill them frequently

Goal: 5 min/hour

Suggestions

At Work

- Walk and Talk
  - Walking meetings

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  - Instead of email

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At Work

- Walk and Talk
  - Walking meetings
  - Instead of email
- Set reminders to get up (computer, smart phone)
- Take Stand & Stretch breaks
- Don't eat lunch at desk!

Goal: 5 min/hour

Suggestions

At Home

- Walk in evenings & on weekends (dogs are good)
- Lose the TV remote
- Stand up during commercials
- Cook from scratch (stand)
- Do yard work – manually

- Goal: 10-20 min/hour

Summary

- Physical activity affects:
  - Trigycleride levels
  - Blood flow/blood clotting
  - Glucose and insulin
- Time, not intensity

Summary

- Don't focus *only* on exercise time
- Don't ignore sitting time
- Both too much sitting and too little exercise are to blame.

Questions?