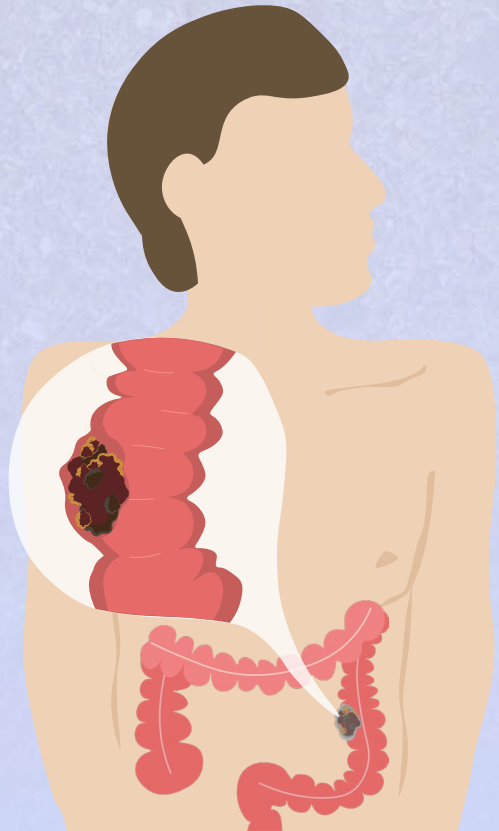


# Primary prevention: Physical activity as a protective factor for cancer onset



**Casper Simonsen**  
Group Leader, PhD

**Centre for Physical Activity Research (CFAS)**  
Copenhagen University Hospital – Rigshospitalet  
Copenhagen, Denmark



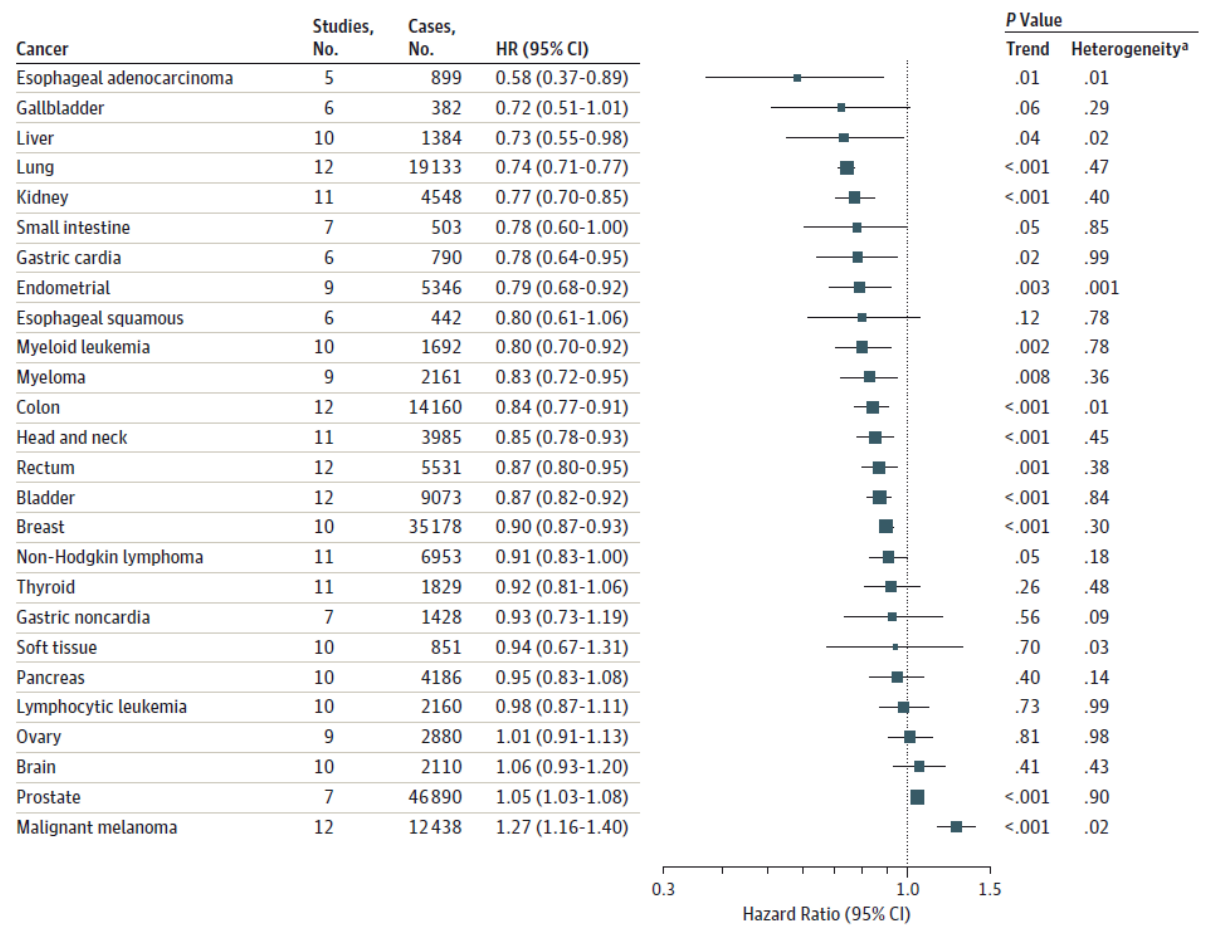
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# Do I have a lower risk of cancer if I am physically active?

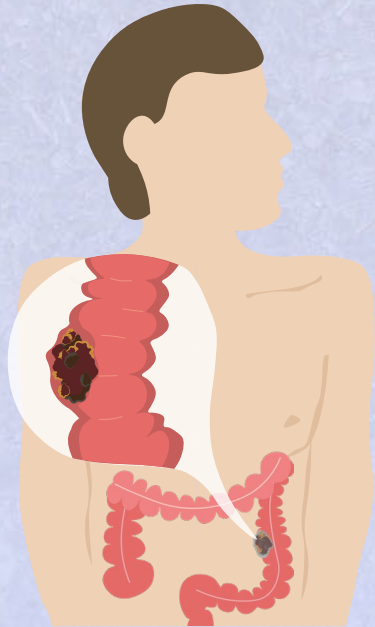


Leisure-time physical activity is associated with lower risk of 13 different cancers

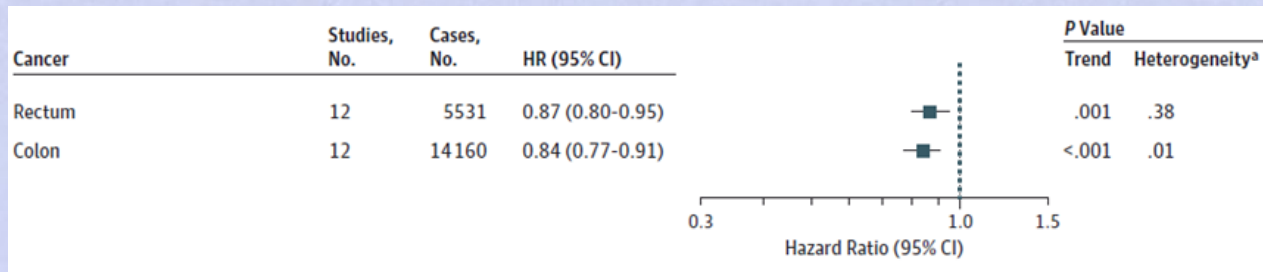
Moore et al. 2016; *JAMA Intern Med*



# Do I have a lower risk of cancer if I am physically active?



Leisure-time physical activity is associated with a ~15% lower risk of colorectal cancer



Moore et al. 2016; *JAMA Intern Med*



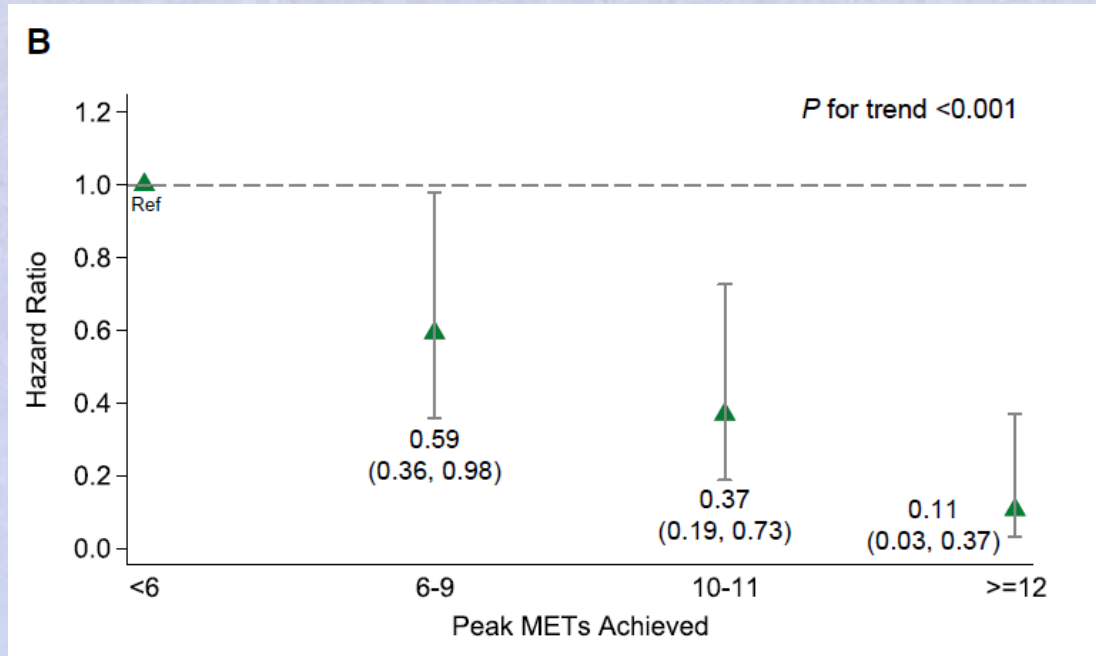
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# Do fit individuals have a lower risk of colorectal cancer?



Marshall et al. 2019, *Cancer*



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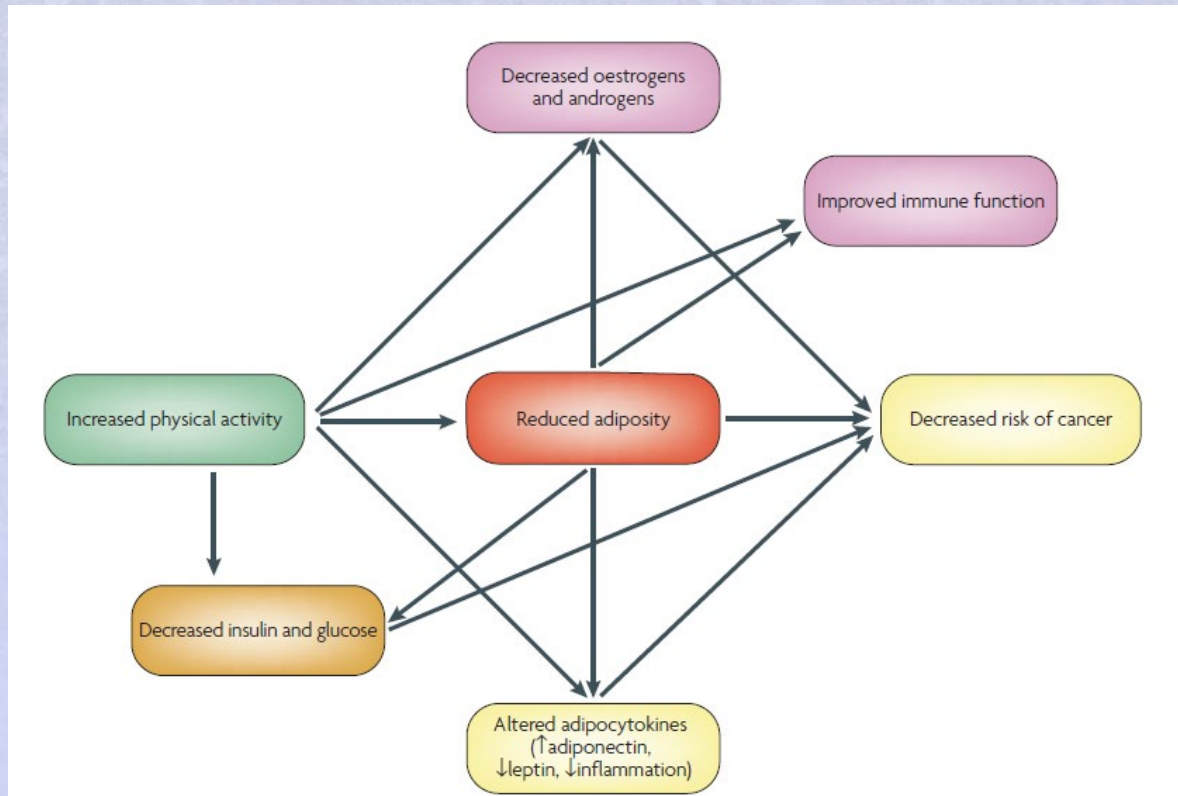
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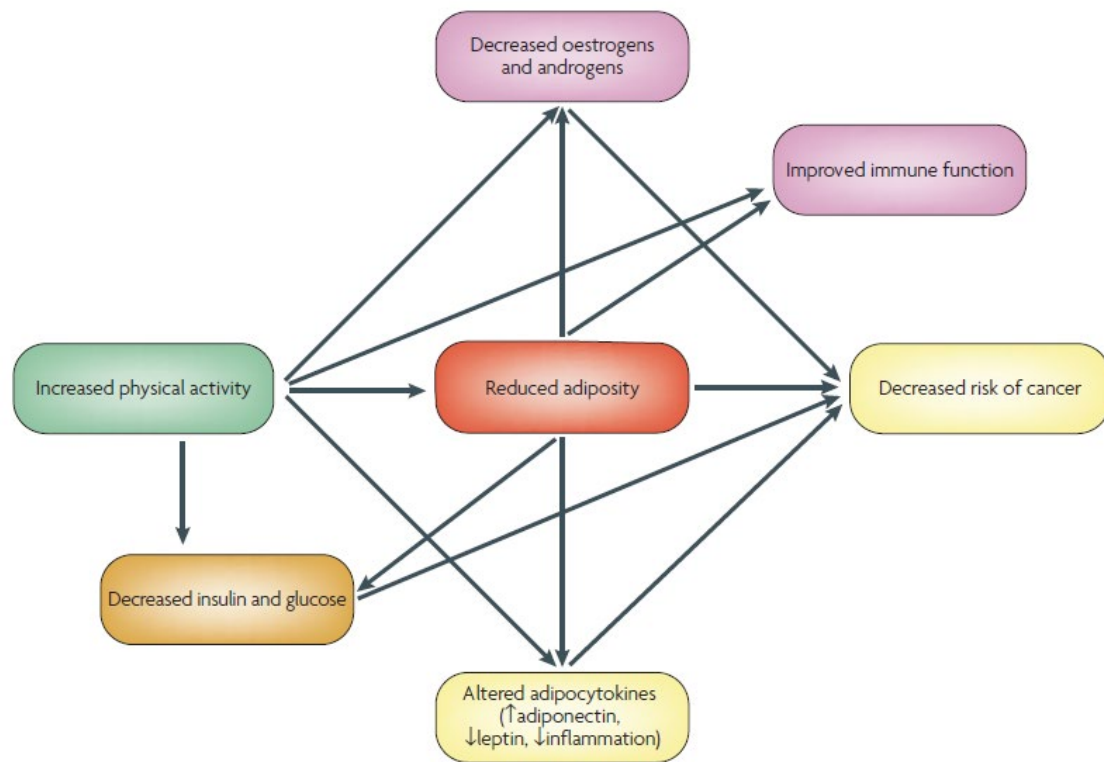
# Physical activity and reduced adiposity



A prevailing hypothesis is that physical activity reduces the risk of cancer through weight loss

McTiernan 2008, *Nat Rev Cancer*; Moore et al. 2016, *JAMA Intern Med*

# Physical activity and reduced adiposity



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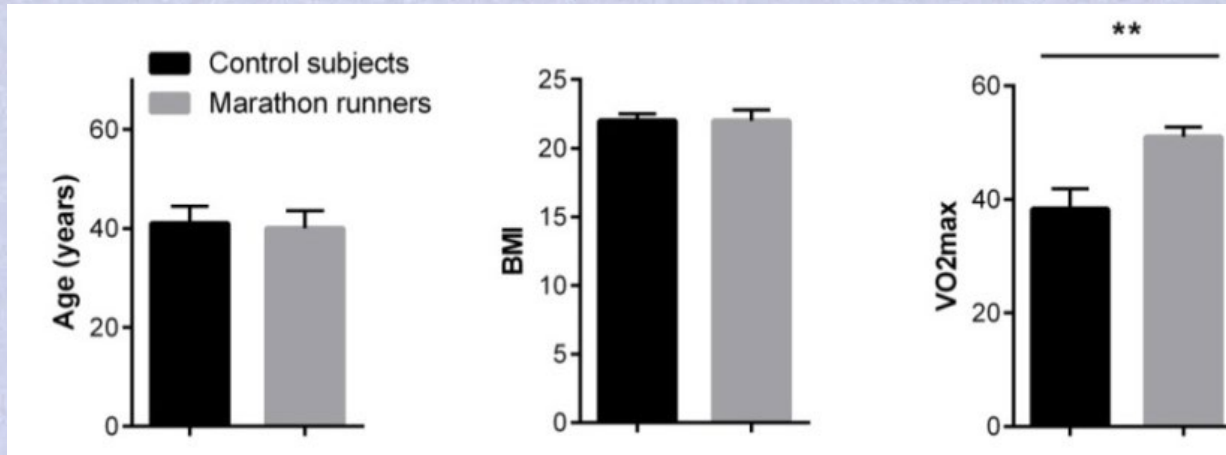
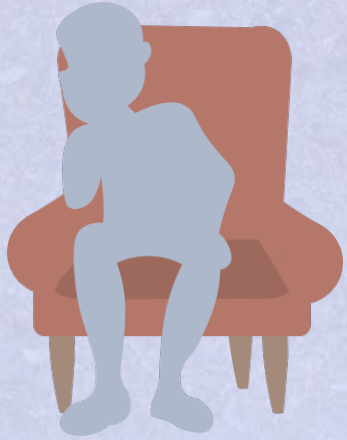
Cancer <sup>c</sup>	HR (95% CI)		Difference in HR, %
	Not BMI Adjusted	BMI Adjusted	
Colon	0.84 (0.77-0.91)	0.87 (0.80-0.94)	3.6
Rectum	0.87 (0.80-0.95)	0.88 (0.81-0.96)	1.1

But the effect of physical activity is still strong after adjustment for BMI.

McTiernan 2008, *Nat Rev Cancer*; Moore et al. 2016, *JAMA Intern Med*

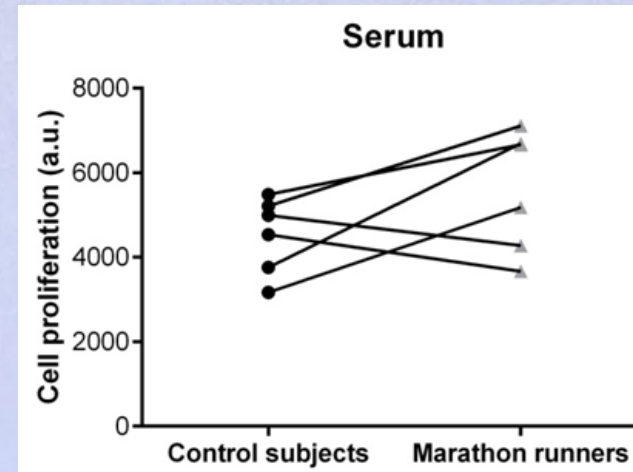
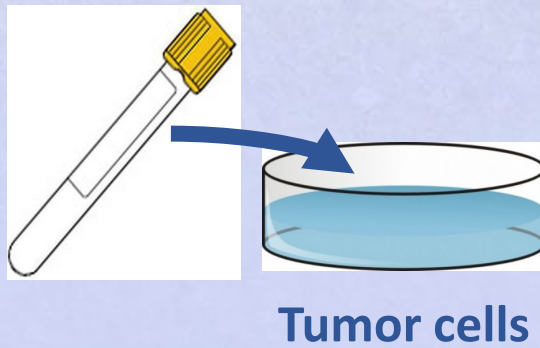
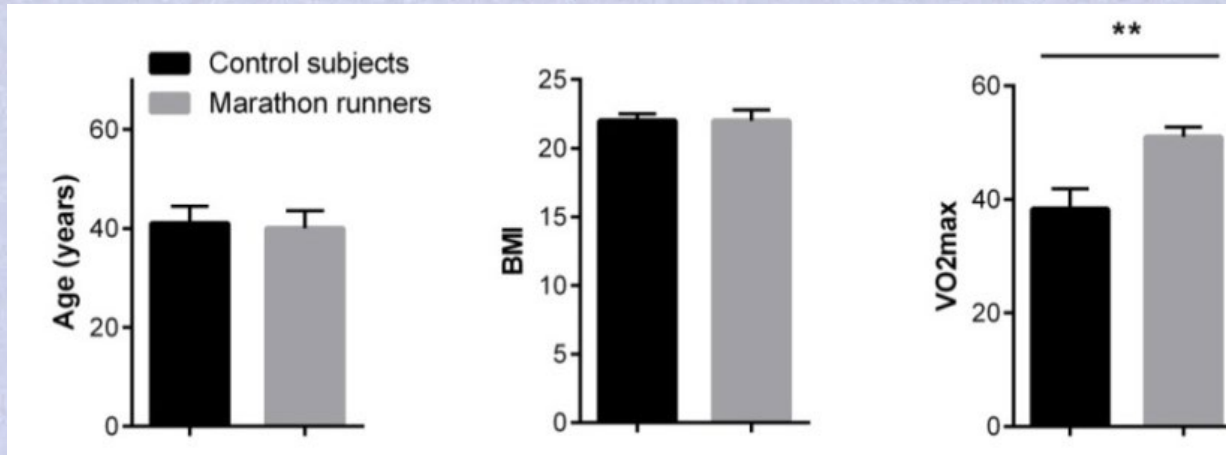
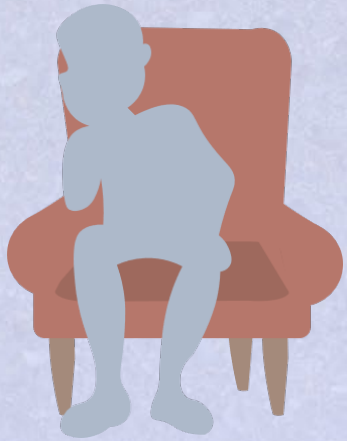


# Training status does not affect cancer cell proliferation



Dethlefsen et al. 2017, *Cancer Res*

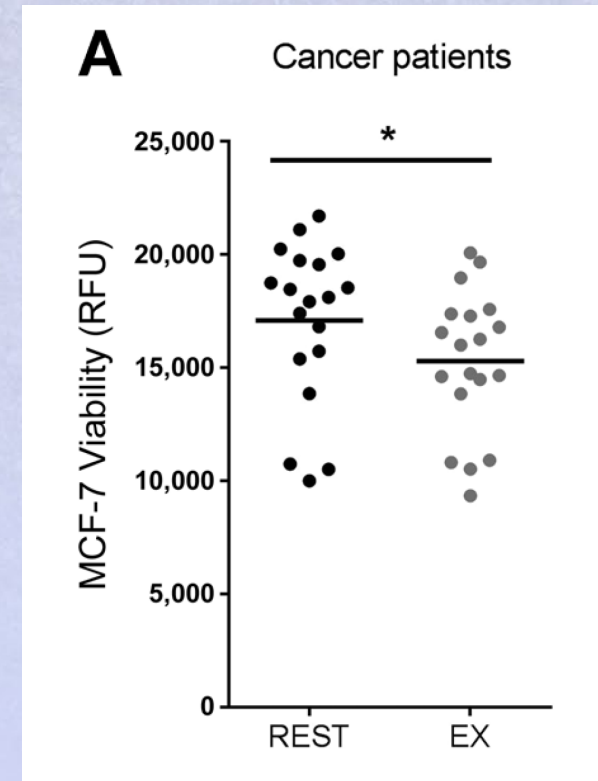
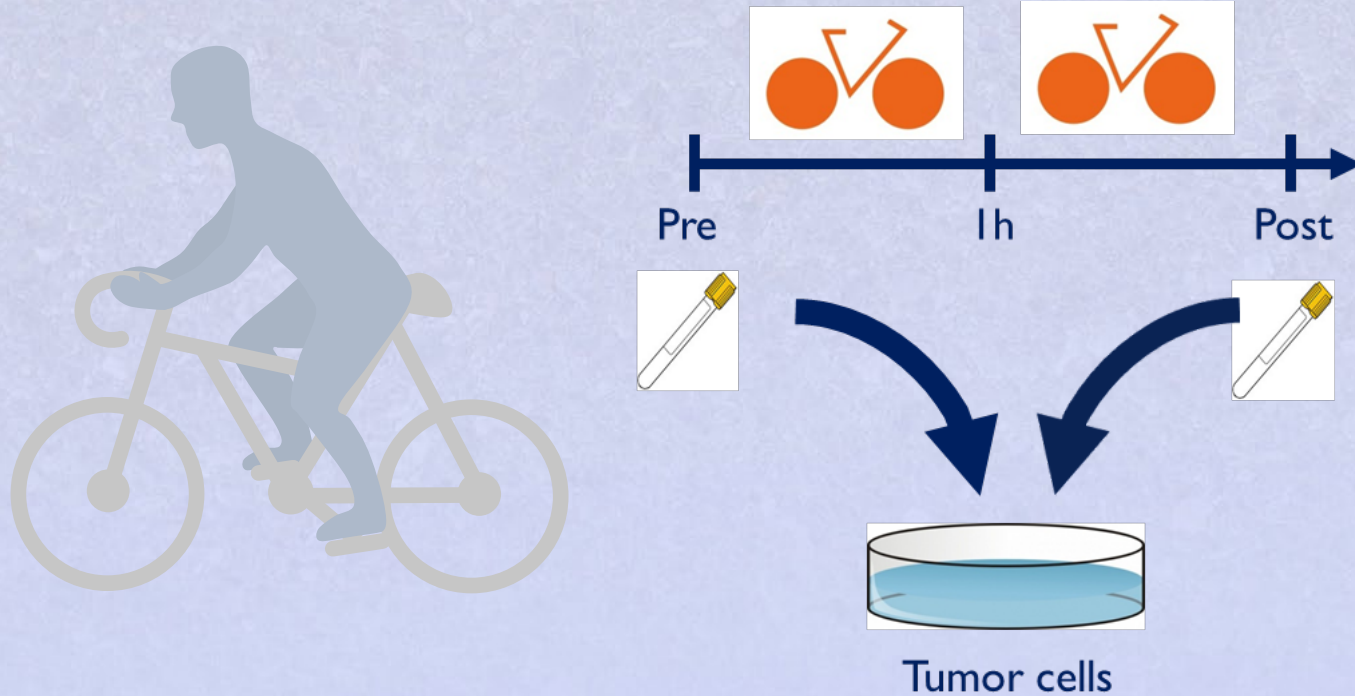
# Training status does not affect cancer cell proliferation



Dethlefsen et al. 2017, *Cancer Res*



# Exercise-conditioned serum reduces cancer cell viability



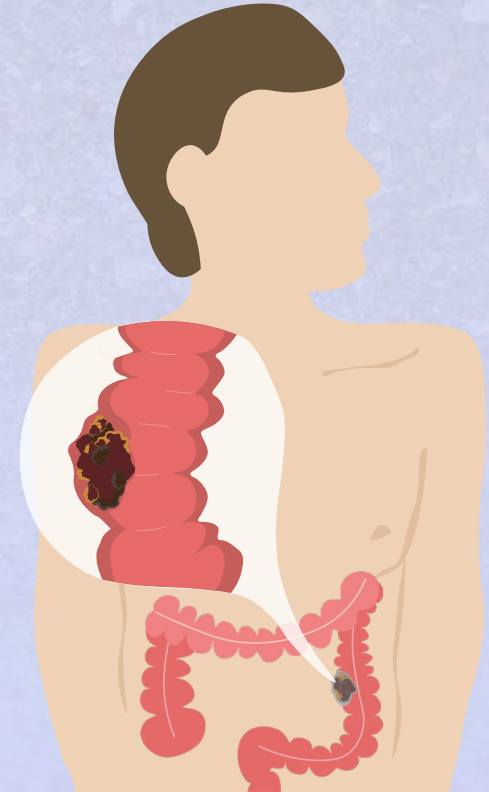
Dethlefsen et al. 2017, *Cancer Res*

# The exercise factor

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What happens when we are physically active that can help explain the lower risk of developing cancer?



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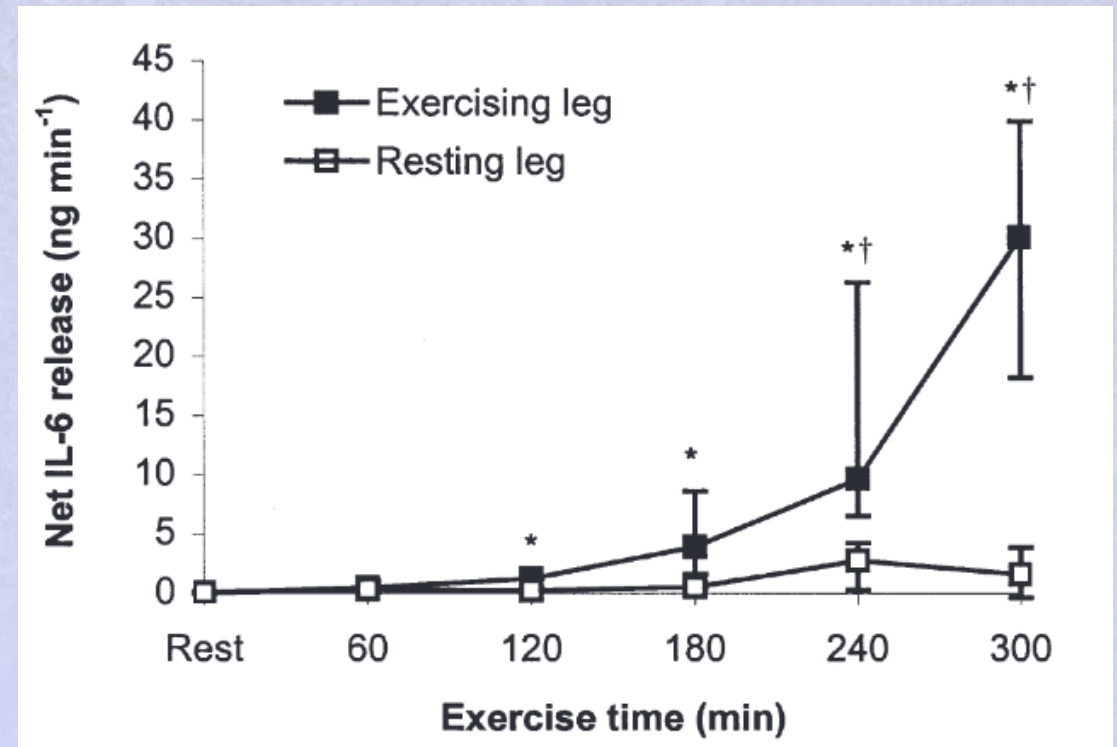
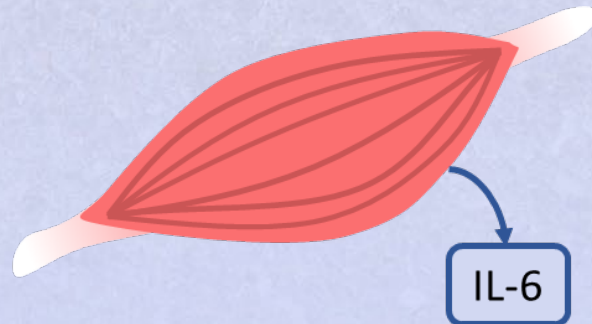
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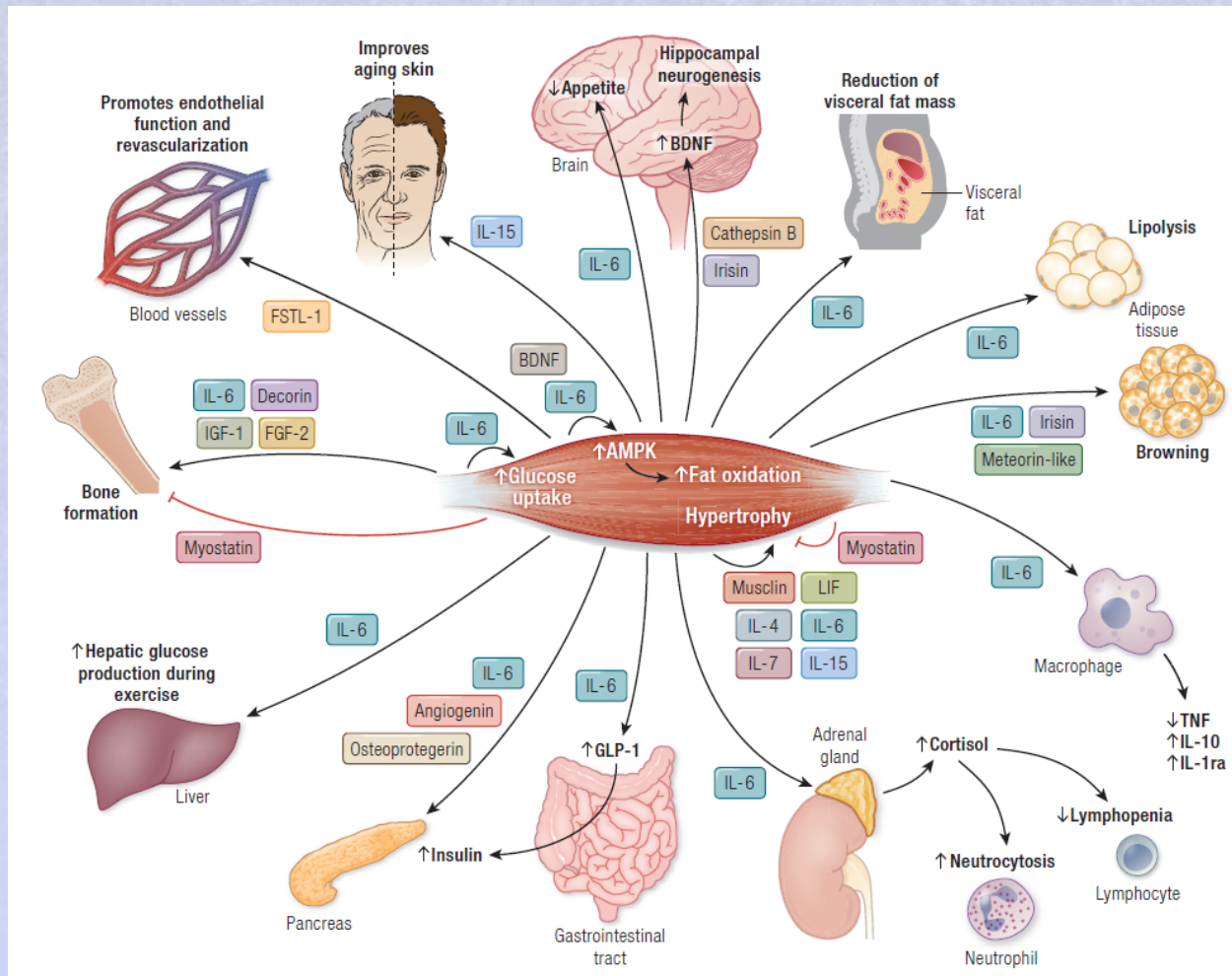


# Skeletal muscles are endocrine organs



Stensberg et al. 2000, *J Phys*

# Skeletal muscles are endocrine organs



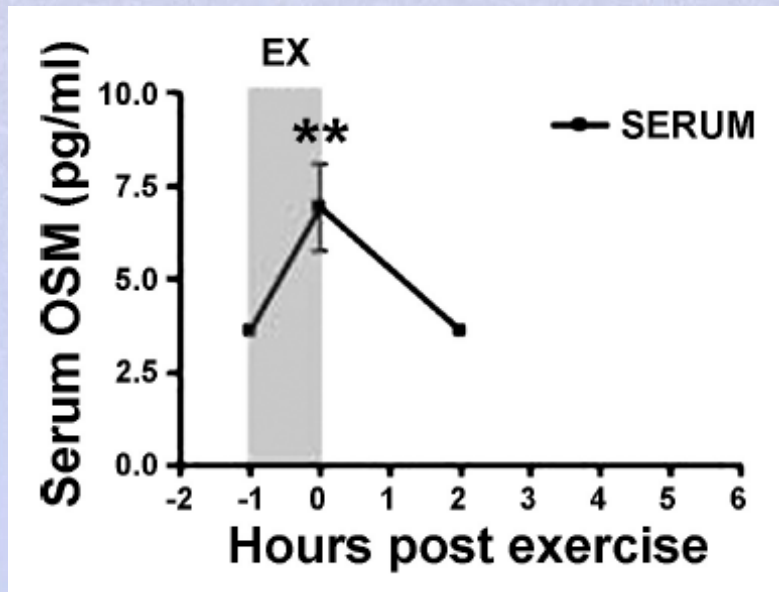
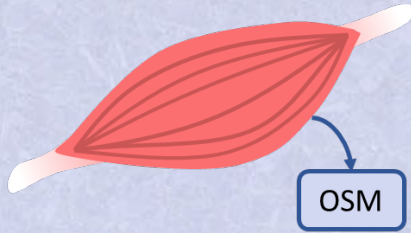
Every time we are physically active, our muscles produce and release “myokines” that can mediate the communication between skeletal muscles and other organs.

Some of these myokines have “anti-cancer effects”

Severinsen and Pedersen 2020, *Endocr Rev*



# Oncostatin M – An anti-cancer myokine



Hojman et al. 2011, *Am J Physiol Endocrinol Metab*



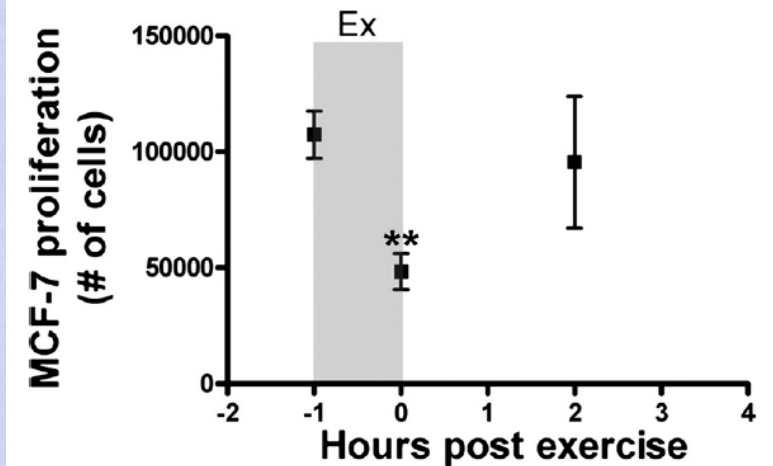
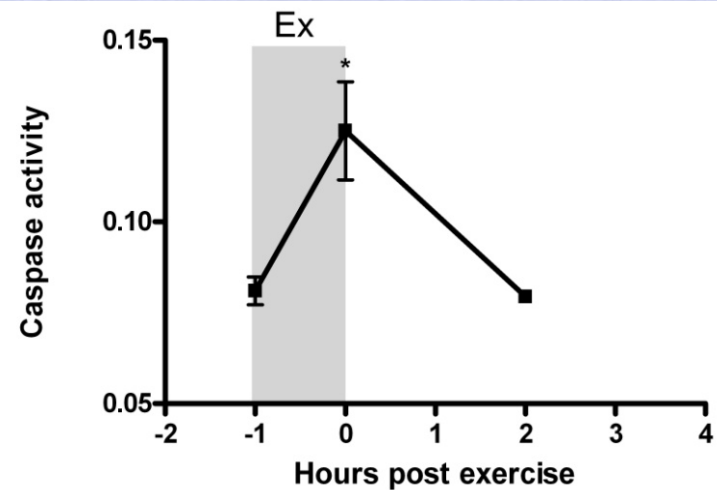
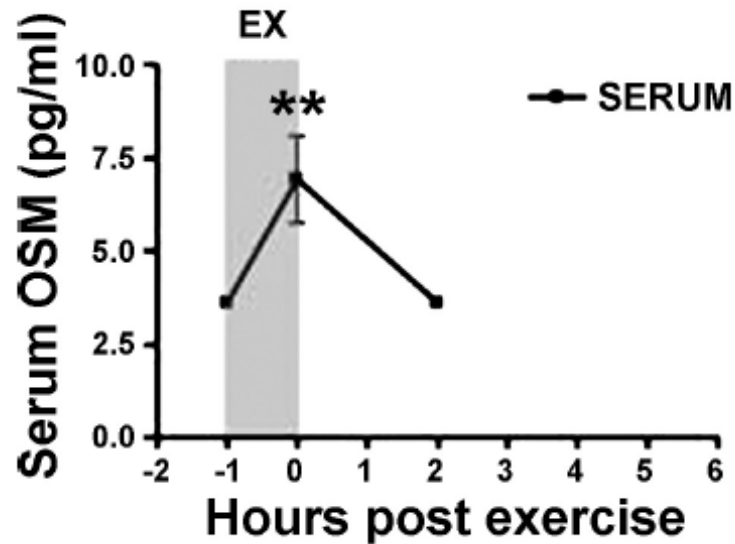
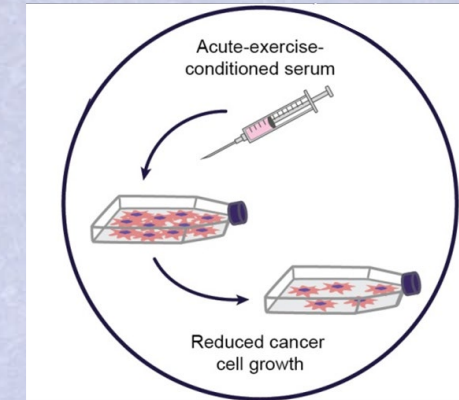
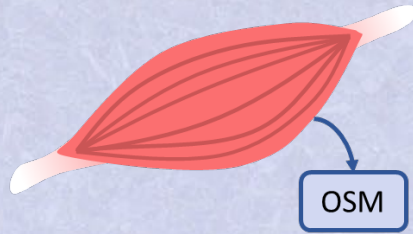
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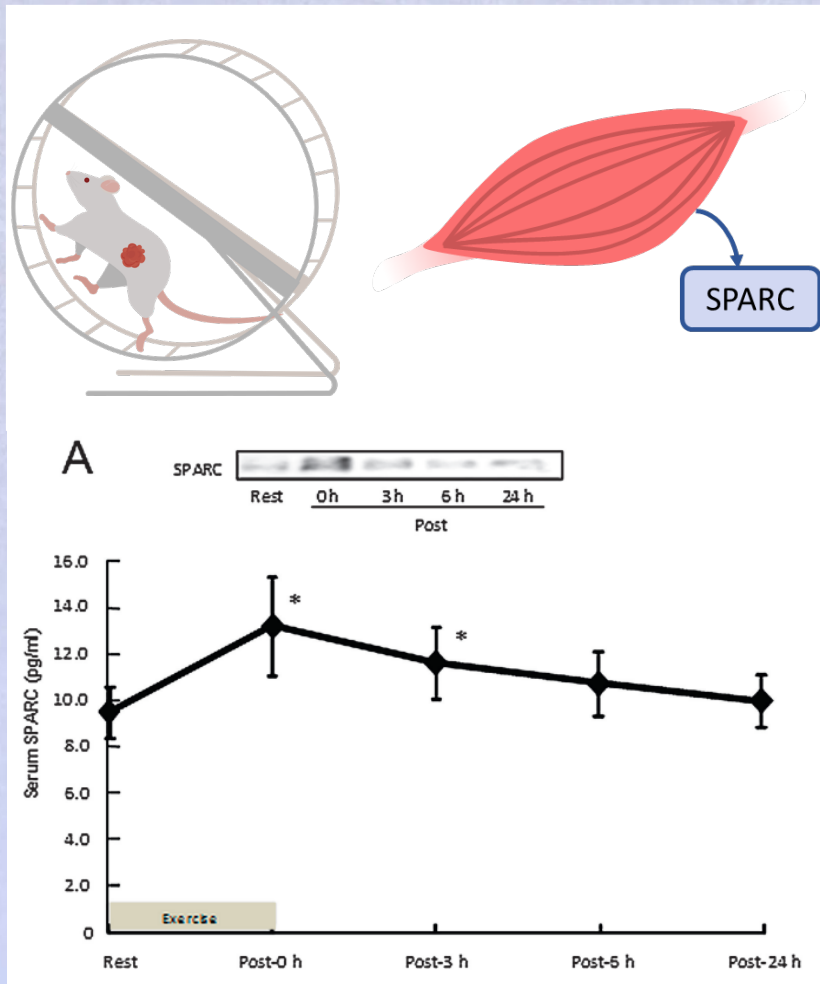
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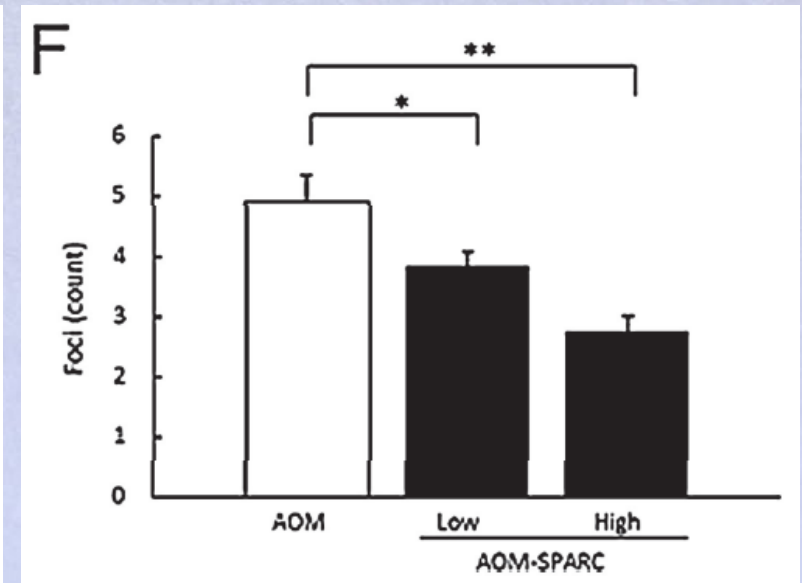
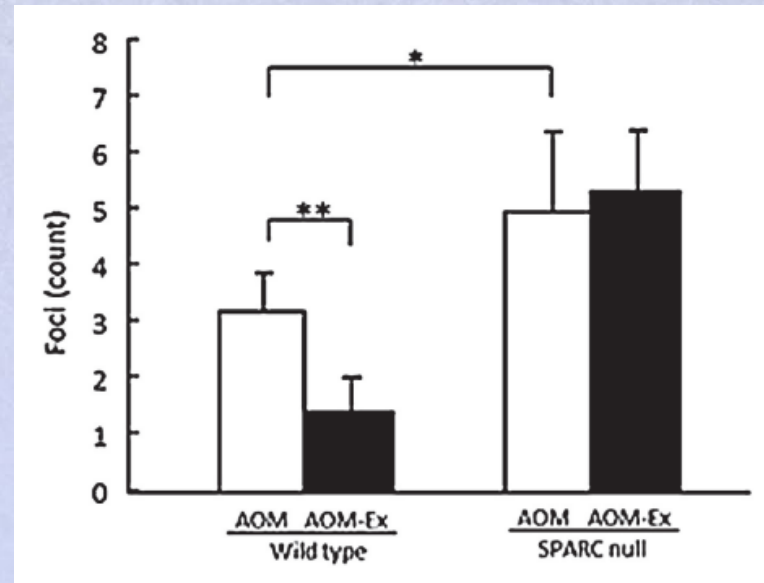
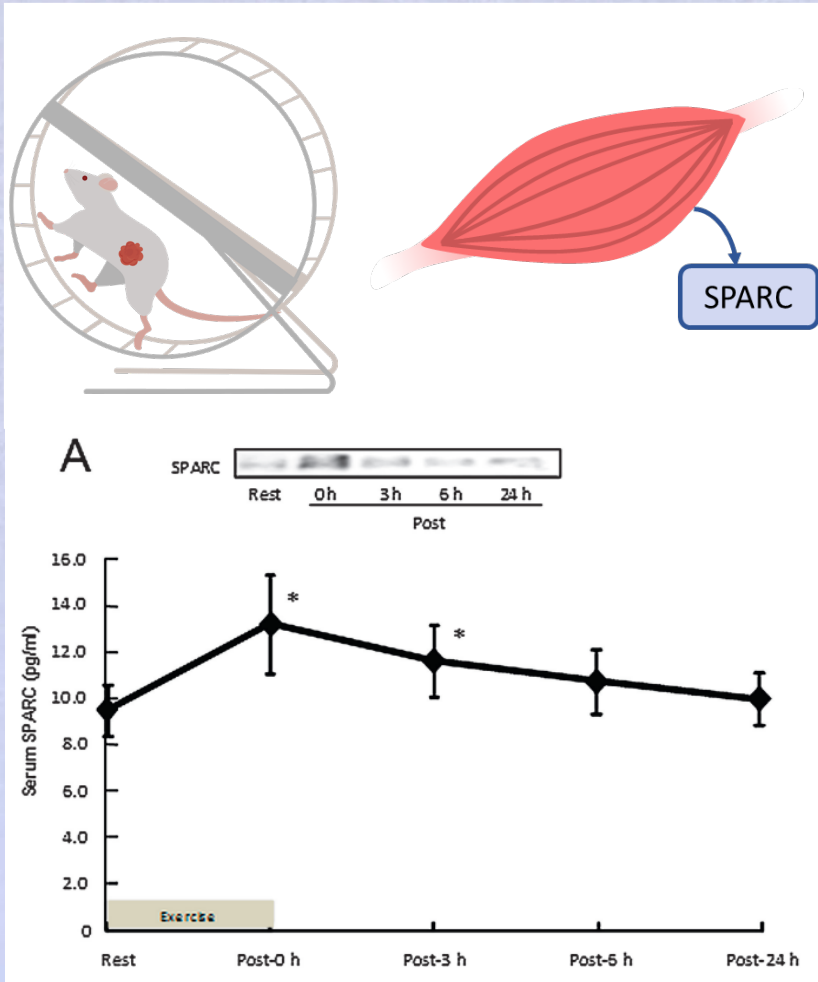


# SPARC – A myokine suppressing onset of colon cancer?



Aoi et al. 2013, *Gut*

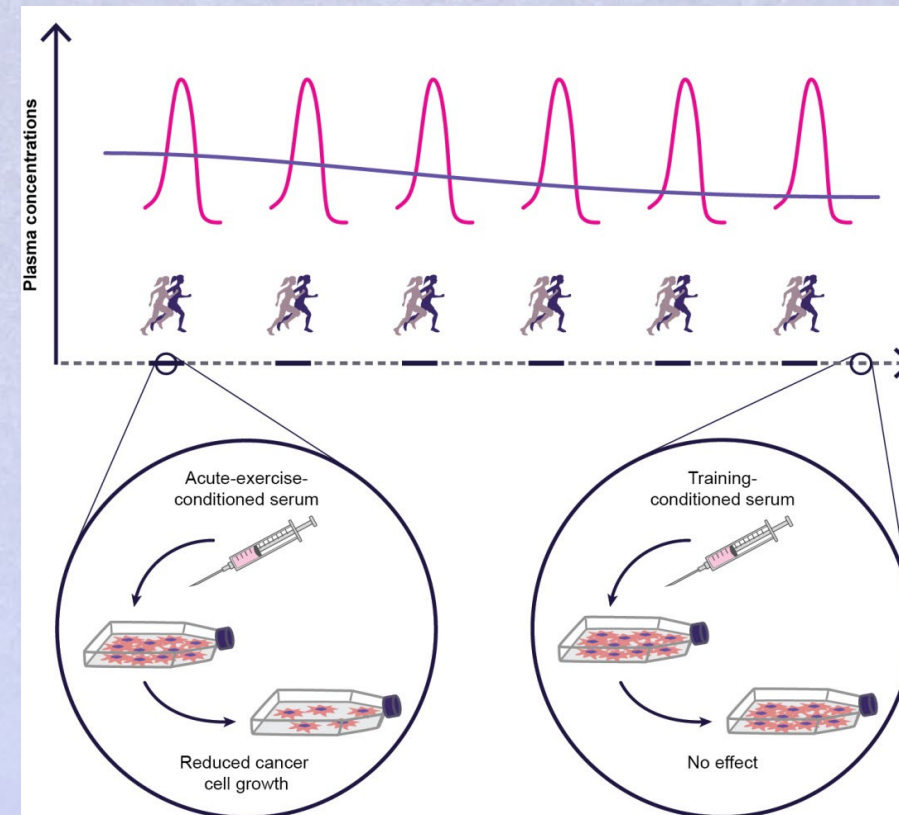
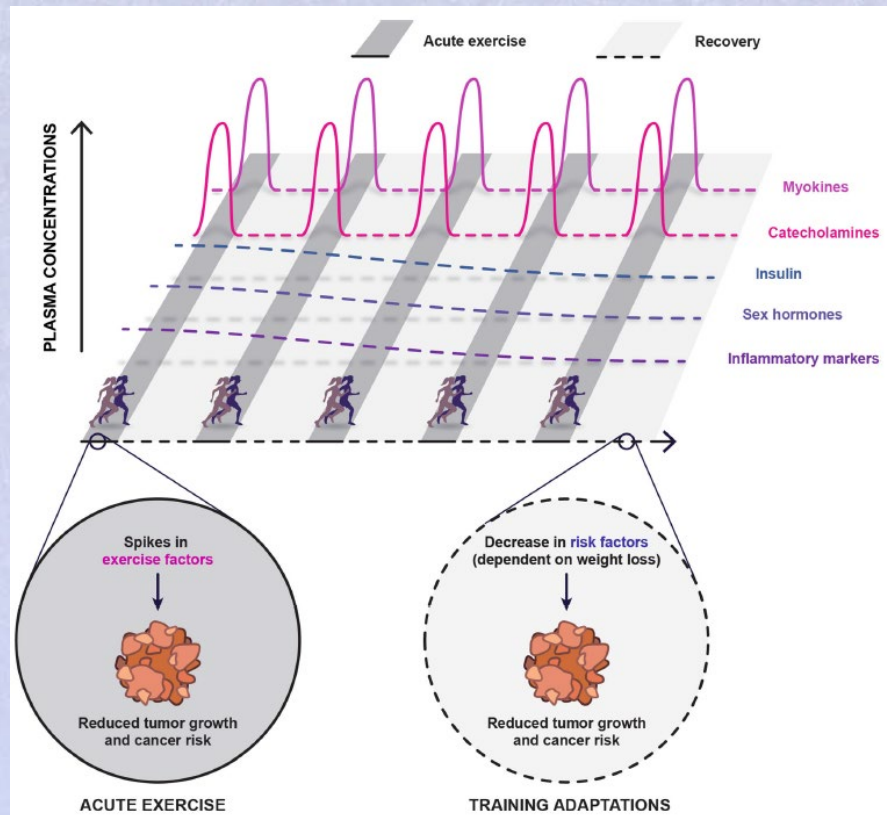
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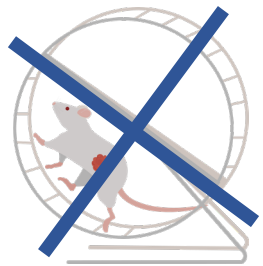
# Every exercise bout matters



With every exercise bout, we create an "anti-cancer environment"

Dethlefsen et al. 2017, *Breast Cancer Res Treat*

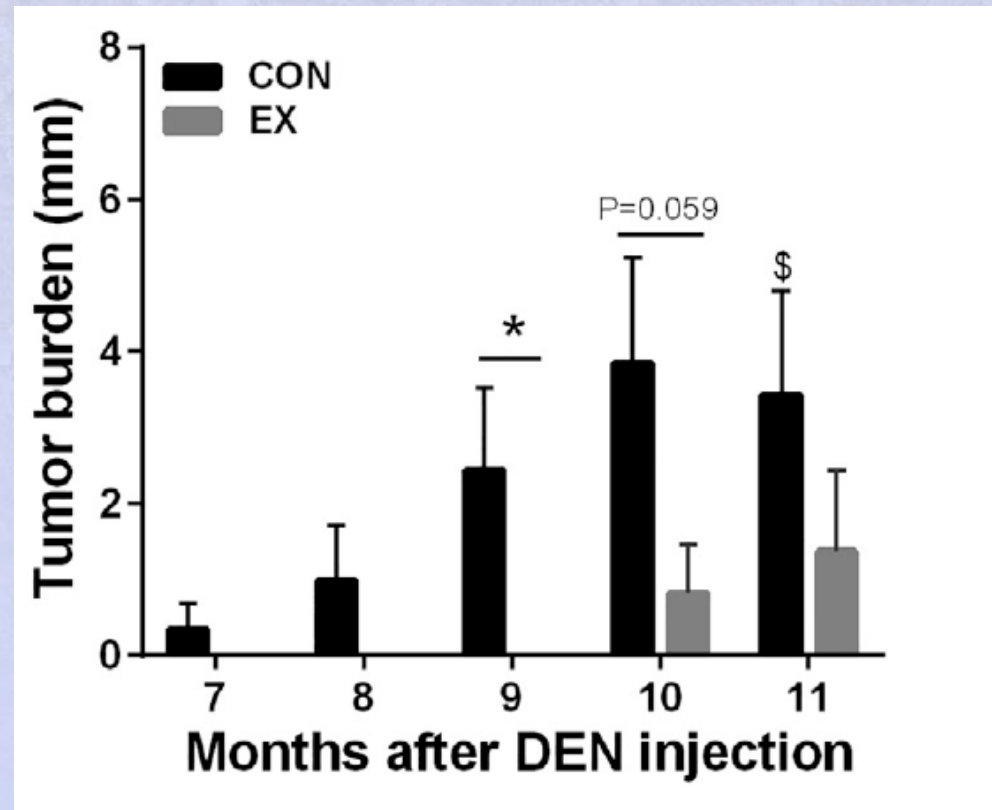
# The effect of voluntary wheel running tumor incidence and burden



CON



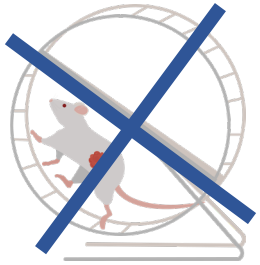
EX



Pedersen et al. 2016, *Cell Metab*



# The effect of voluntary wheel running on tumor growth



CON



Pedersen et al. 2016, *Cell Metab*



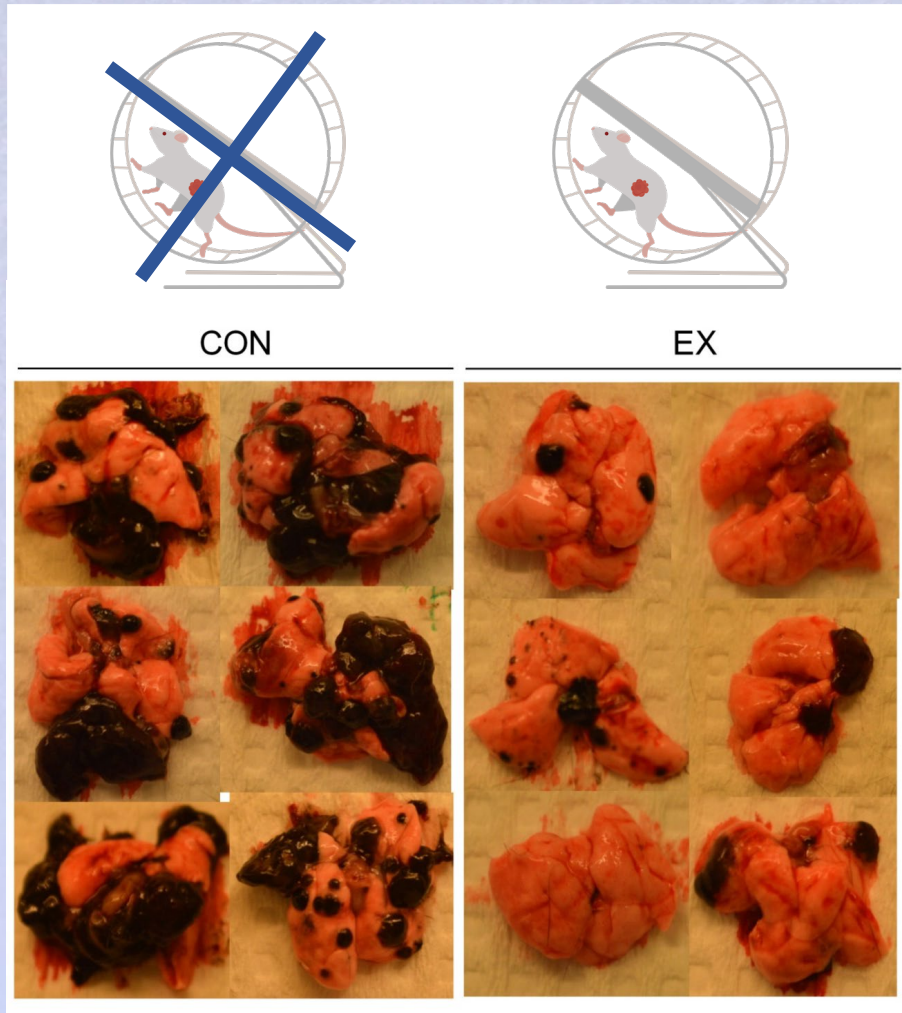
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Pedersen et al. 2016, *Cell Metab*



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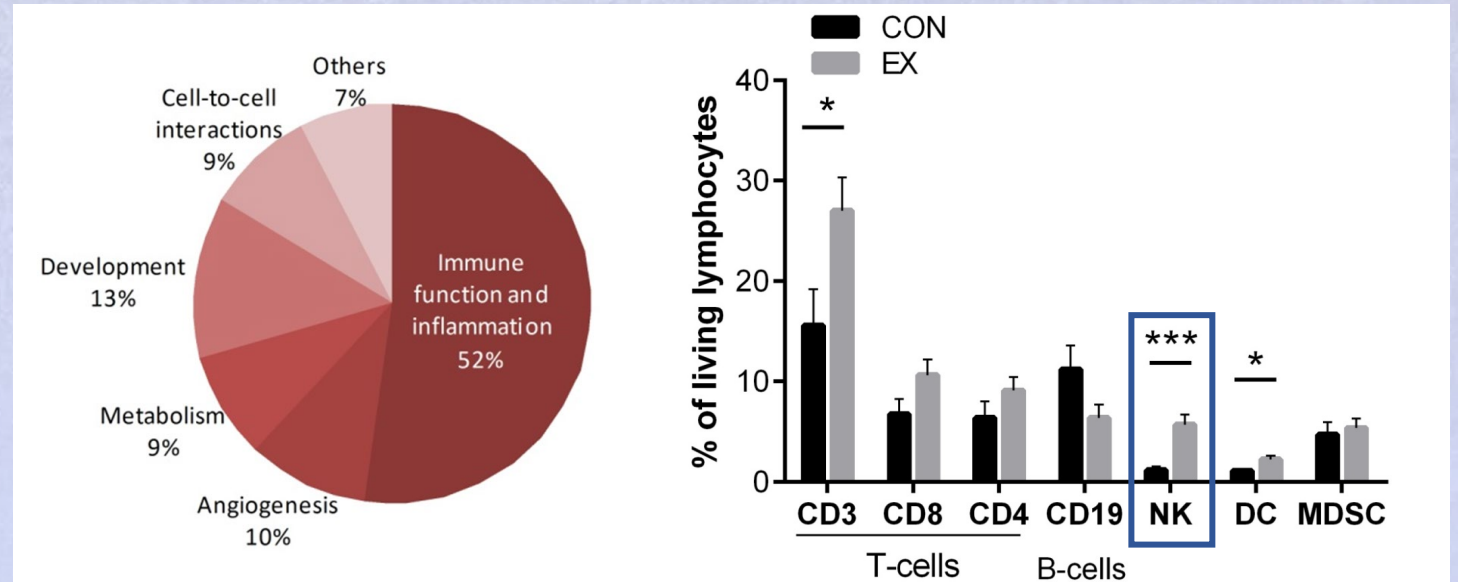
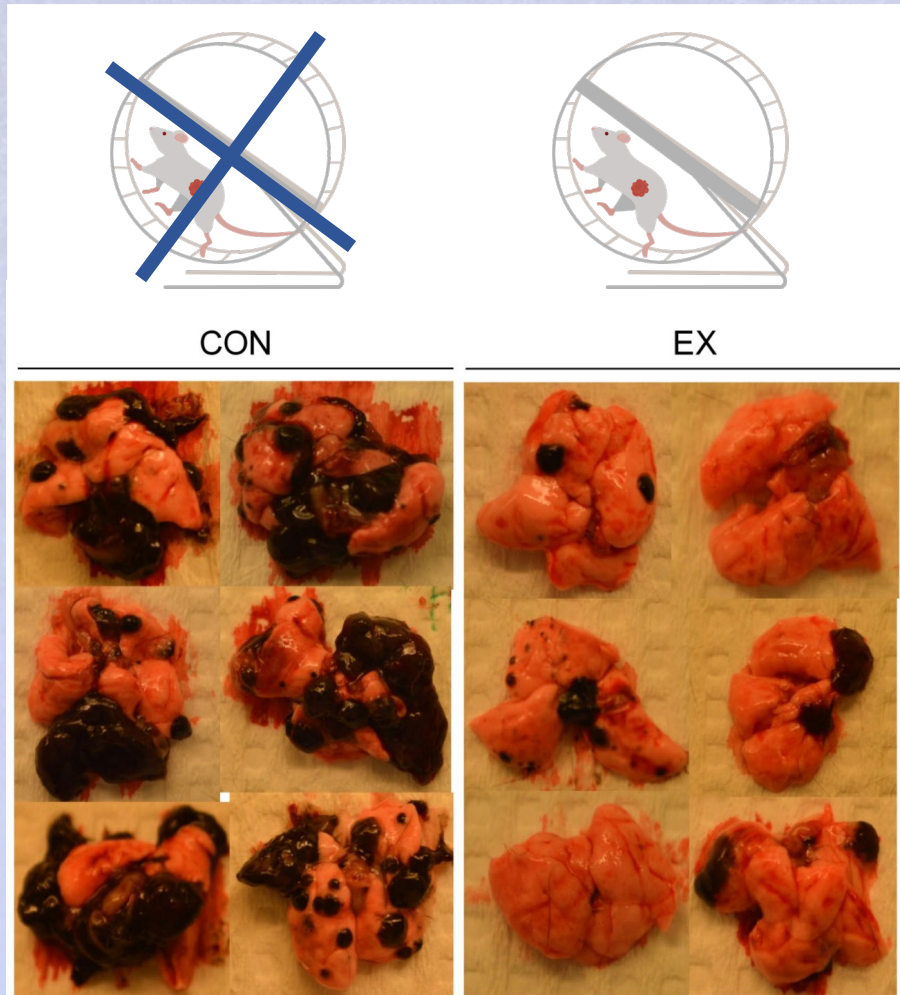
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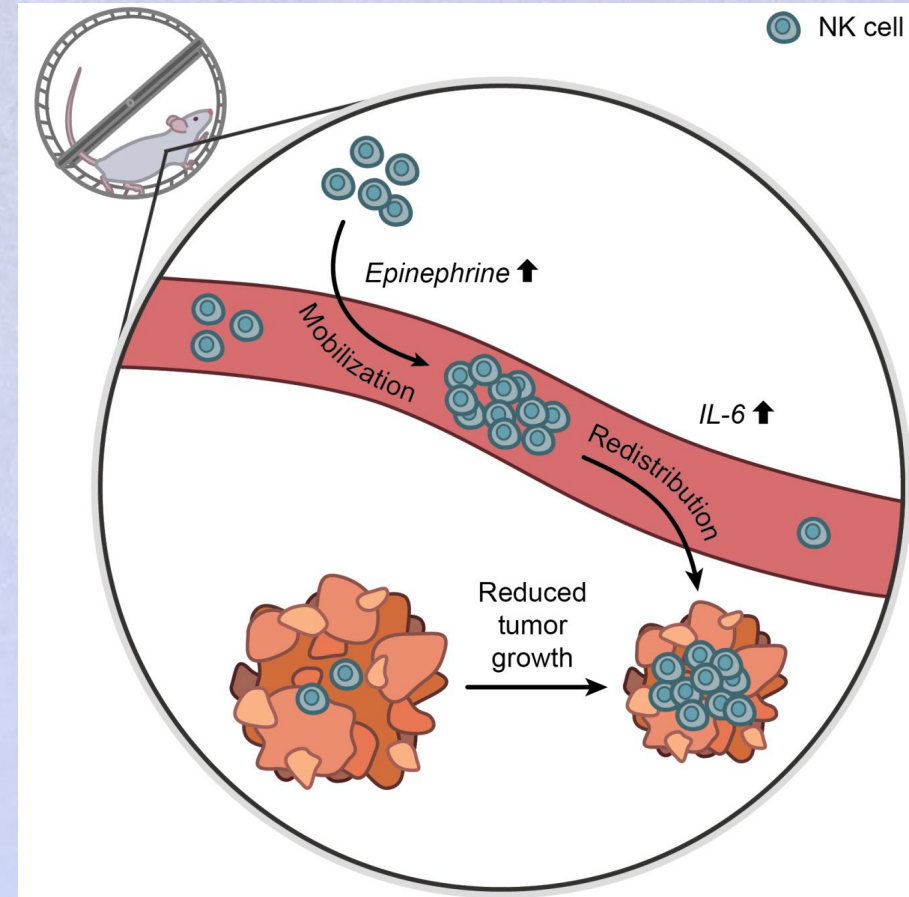
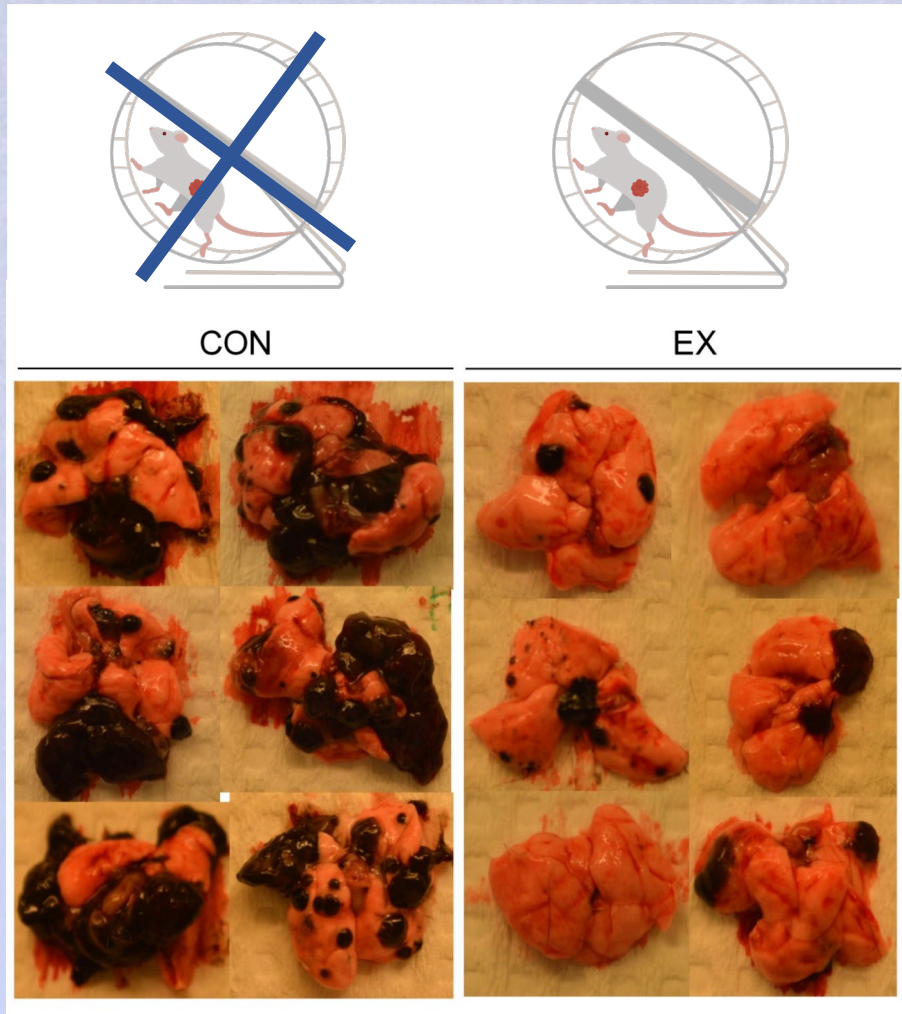
# Voluntary wheel running increases tumor NK cell infiltration



Pedersen et al. 2016, *Cell Metab*



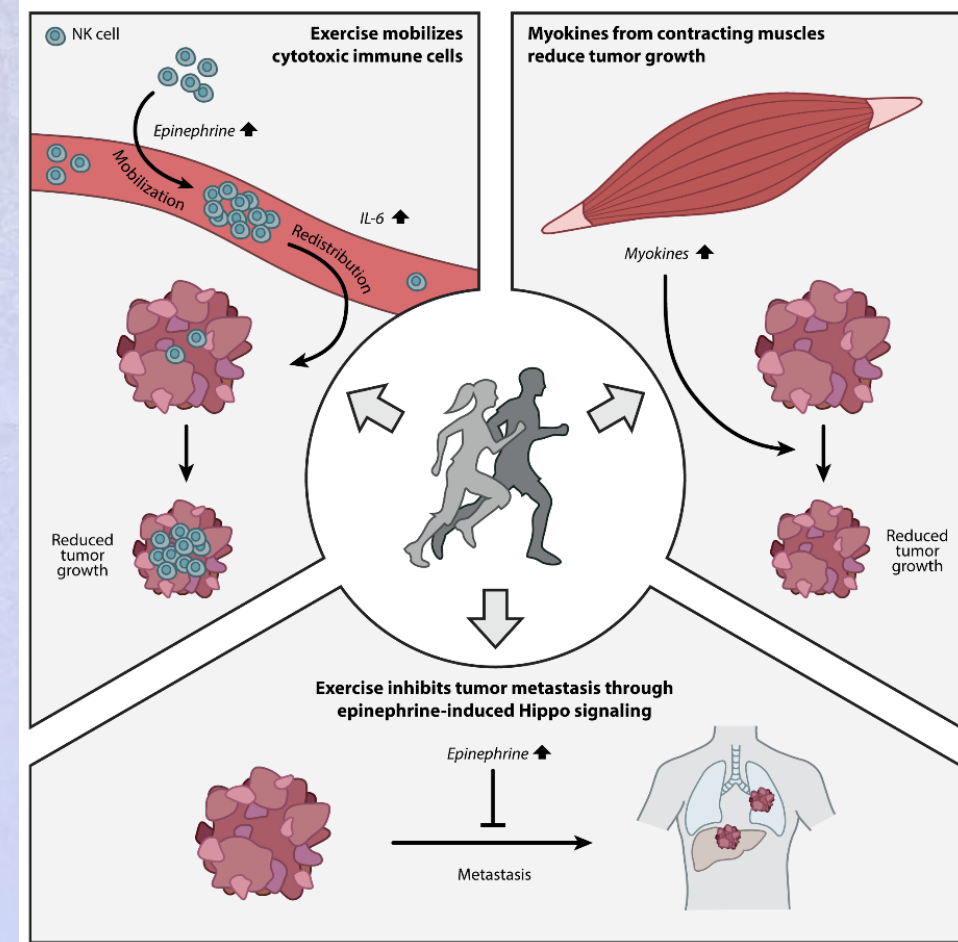
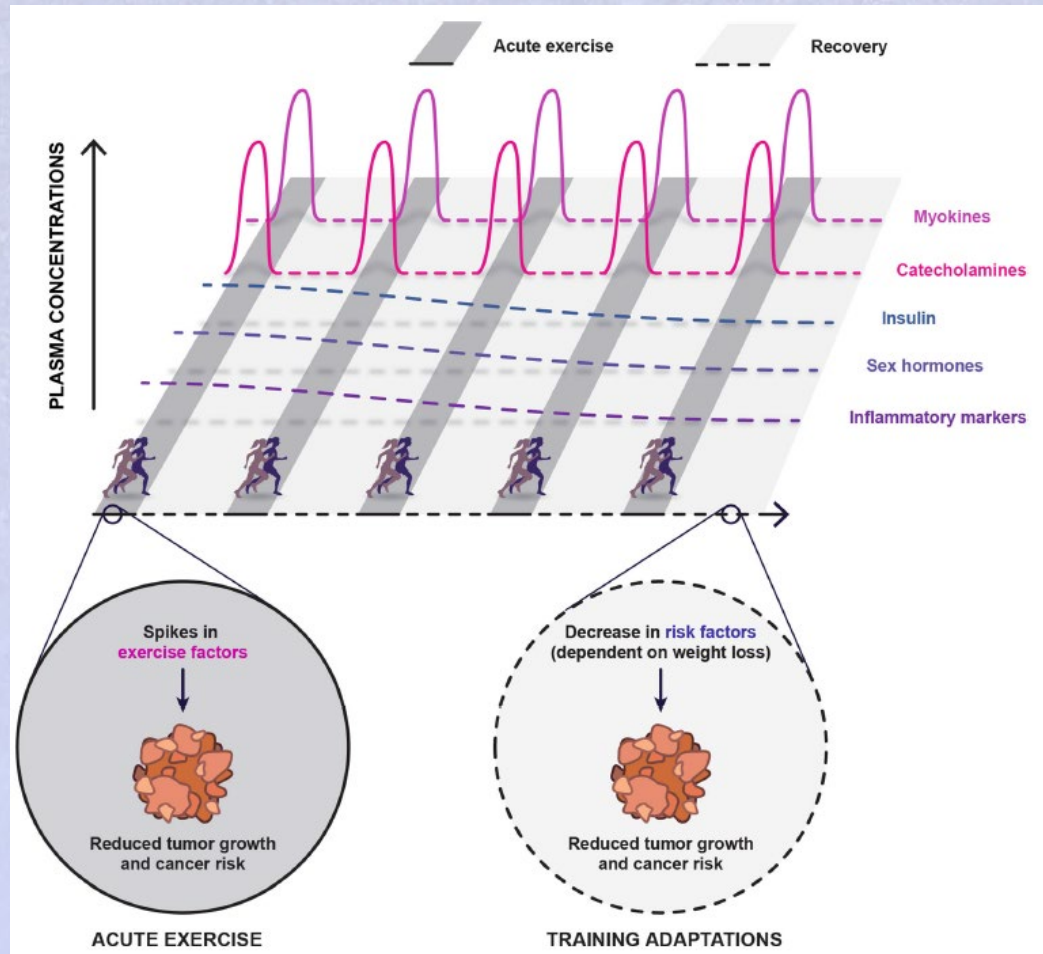
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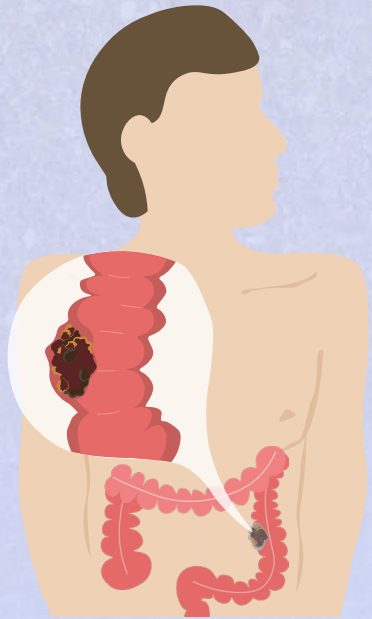


# Molecular mechanisms linking exercise to cancer prevention



Christensen, Simonsen, and Hojman 2019, *Compr Phys*; Hojman et al. 2018, *Cell Metab*

# Primary prevention: Physical activity as a protective factor for cancer onset



Casper Simonsen

Group Leader, PhD

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Copenhagen University Hospital – Rigshospitalet  
Copenhagen, Denmark



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