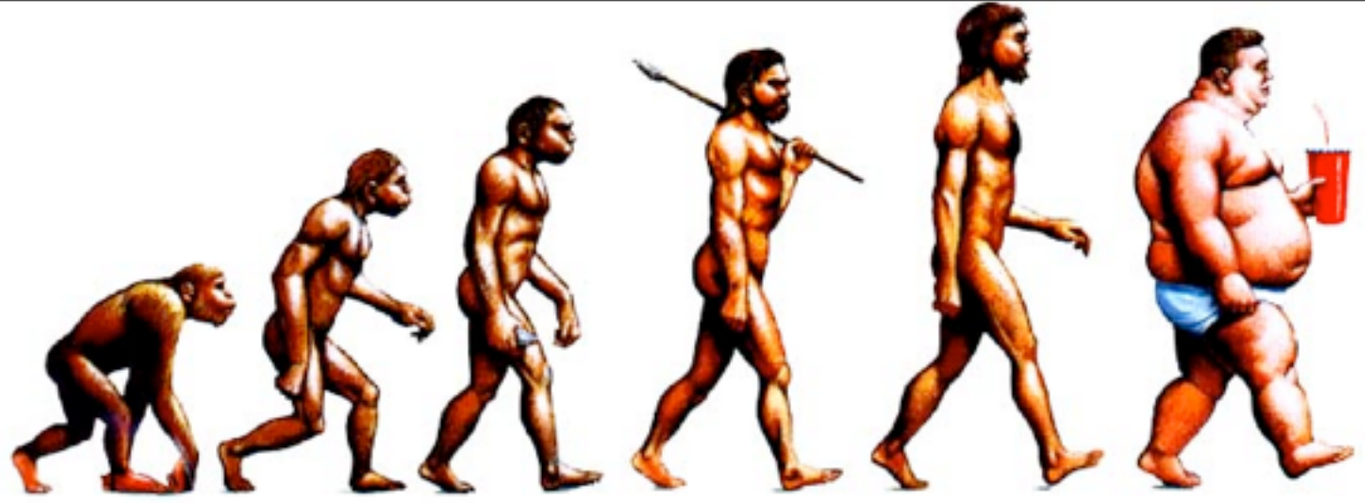

mTOR and caloric restriction: the ultimate weight loss/fitness gain protocol

Robert Verkerk PhD

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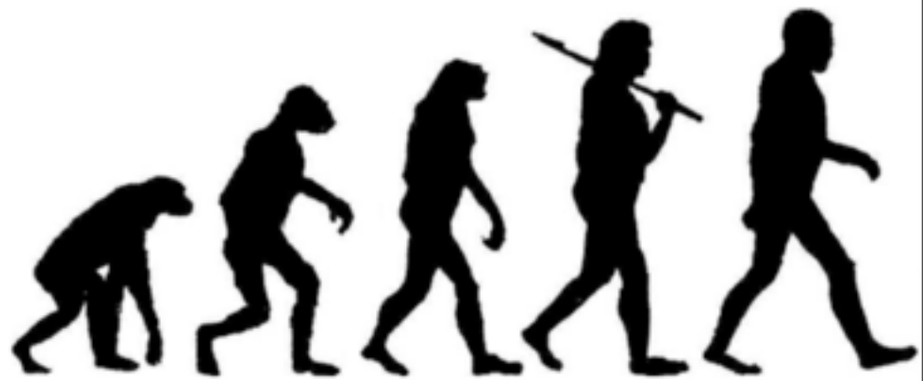
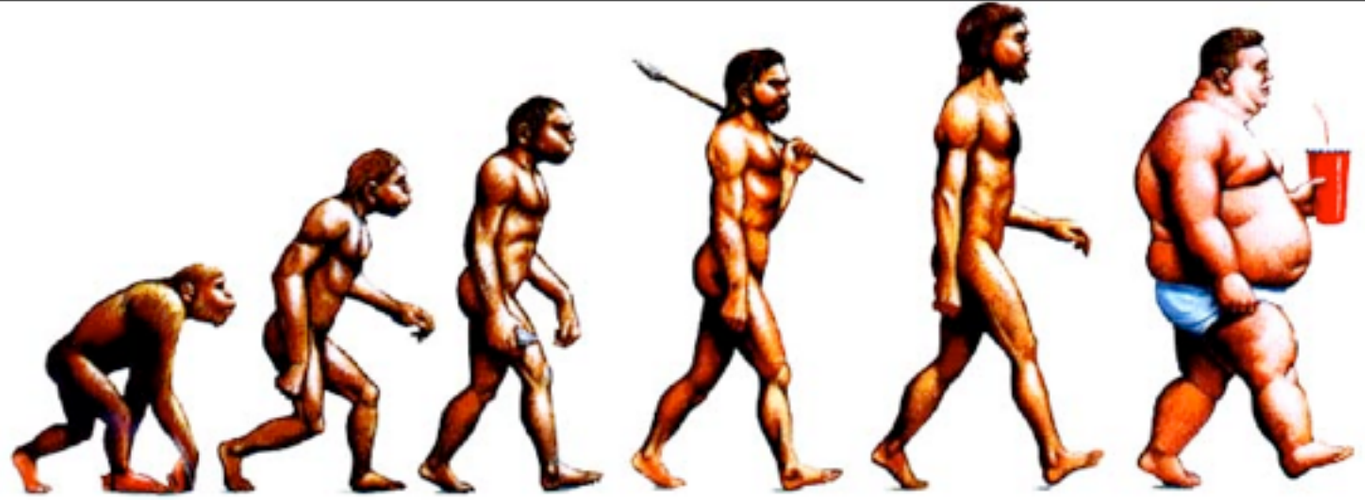


www.anh-europe.org



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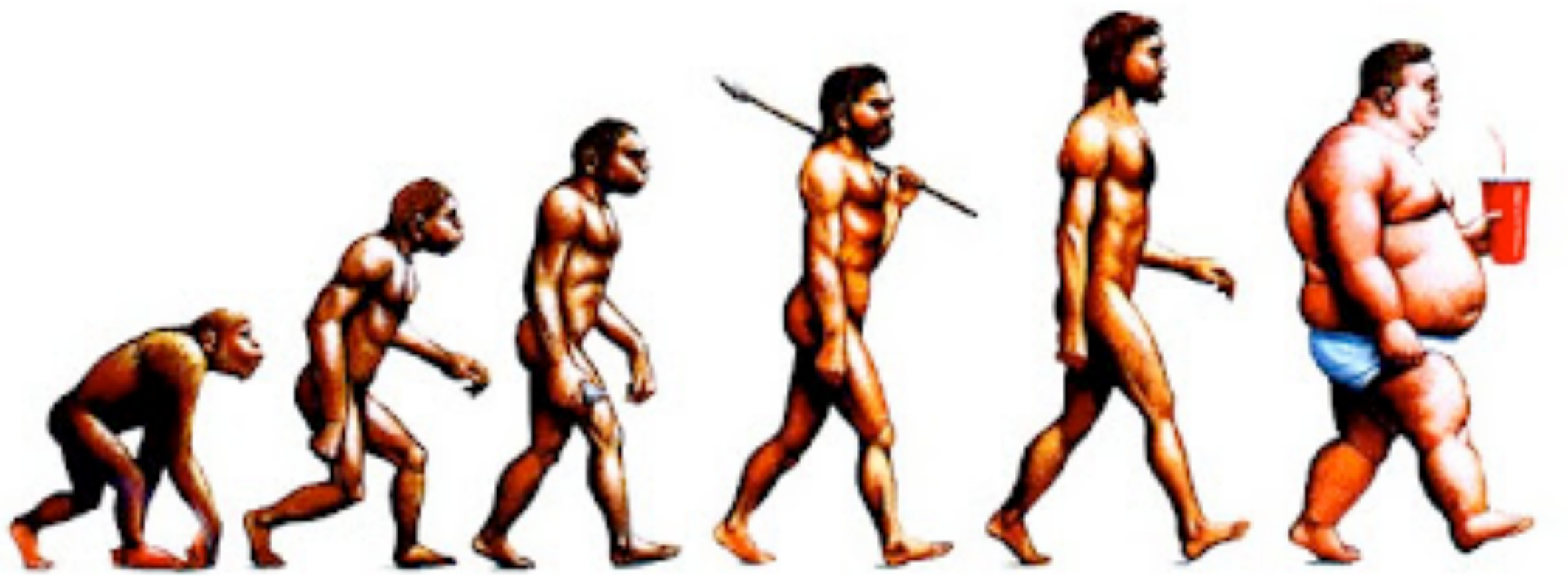
Where are we going?



Where was I going?

Feb 2008

Where was I going?

Feb 2008

August 2013

Fad or rad…but effective?

Fad or rad…but effective?

- High fibre/'Pritikin'

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein
- Atkins

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein
- Atkins
- Paleo

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein
- Atkins
- Paleo
- Carb reduction

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein
- Atkins
- Paleo
- Carb reduction
- Gluten-free

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein
- Atkins
- Paleo
- Carb reduction
- Gluten-free
- Cereal-free

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein
- Atkins
- Paleo
- Carb reduction
- Gluten-free
- Cereal-free
- CR

Fad or rad…but effective?

- High fibre/'Pritikin'
- Low fat
- Calorie control
- Low glycaemic load
- High fat
- High protein
- Atkins
- Paleo
- Carb reduction
- Gluten-free
- Cereal-free
- CR
- Increased EE

Paleo on the inside…

- Very few if any changes have occurred to the human genome between 50,000 - 10,000 BC

Cordain L, Gotshall RW, Eaton SB, and Eaton SB III. Physical activity, energy expenditure and fitness: an evolutionary perspective. *Int J Sports Med*. 1998; 19: 328–335.

Paleo lifestyles

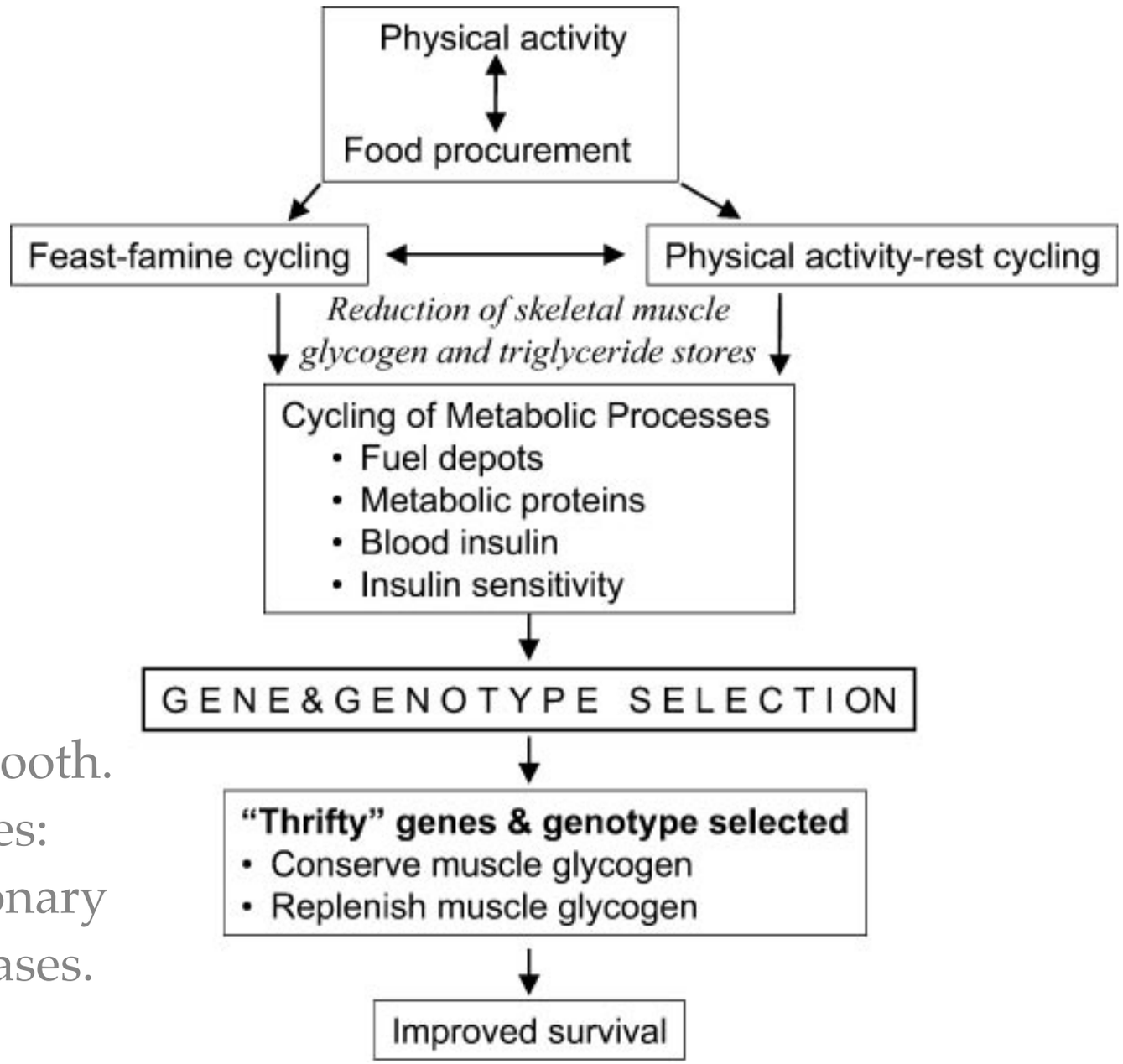
- Hunting & gathering / rest cycles
- Feast-famine / rest-relaxation cycles

The Natural History Museum

Manu V. Chakravarthy and Frank W. Booth. Eating, exercise, and "thrifty" genotypes: connecting the dots toward an evolutionary understanding of modern chronic diseases. *J Appl Physiol*. 2004; 96: 3–10.

‘Thrifty’ genes

- Selection pressure towards ‘thifty’ genes



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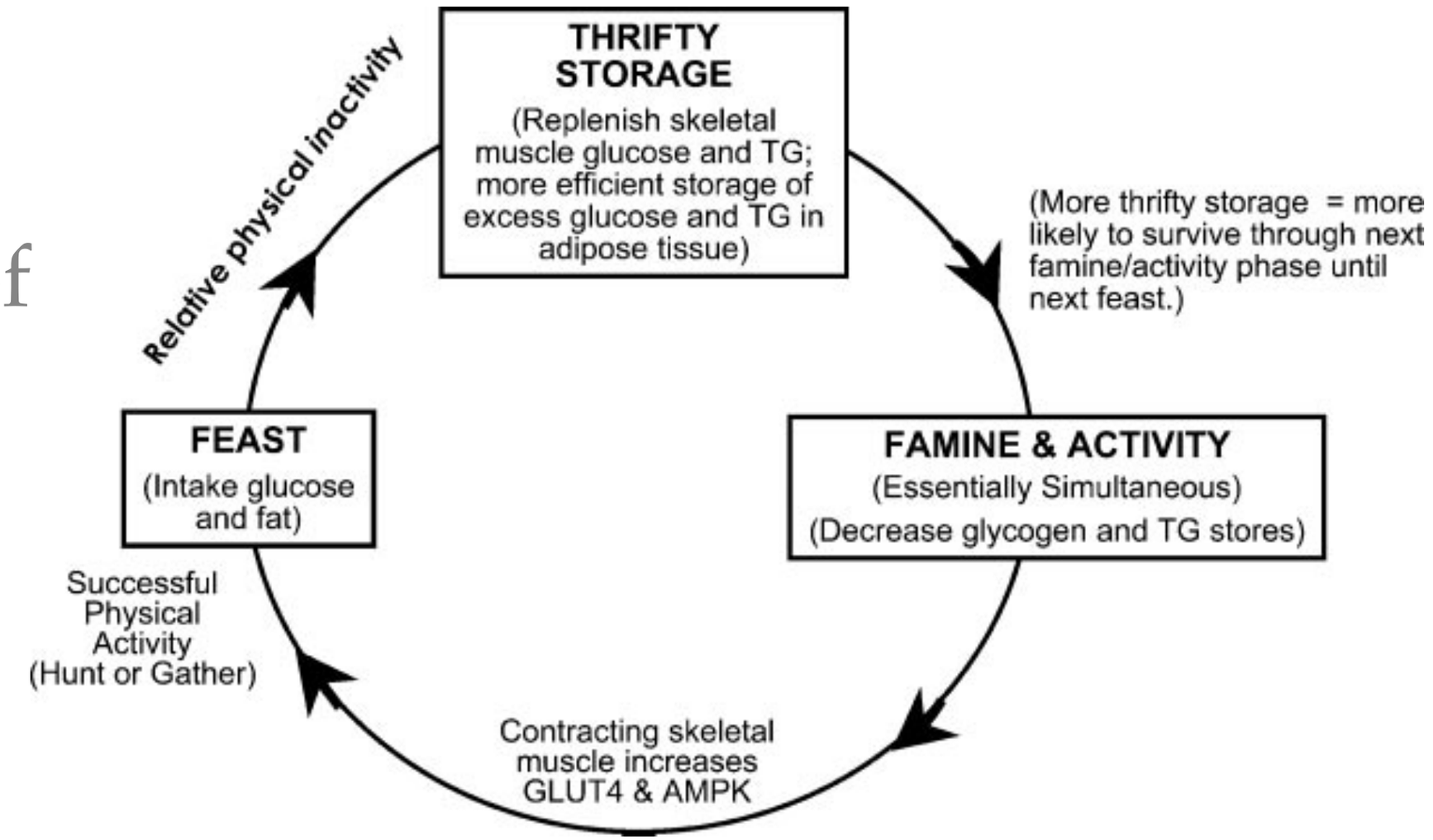
Working on empty

- Efficient storage and utilisation of fuel



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Going sedentary…

- Linked to about 35 chronic diseases

Booth FW, Roberts CK, Laye MJ. Lack of exercise is a major cause of chronic diseases. *Compr Physiol*. 2012; 2(2): 1143-211.

Couch potato diseases

- accelerated biological aging/premature death, low cardiorespiratory fitness (Vo2max), sarcopenia, metabolic syndrome, obesity, insulin resistance, prediabetes, type 2 diabetes, nonalcoholic fatty liver disease, coronary heart disease, peripheral artery disease, hypertension, stroke, congestive heart failure, endothelial dysfunction, arterial dyslipidemia, hemostasis, deep vein thrombosis, cognitive dysfunction, depression and anxiety, osteoporosis, osteoarthritis, balance, bone fracture/falls, rheumatoid arthritis, colon cancer, breast cancer, endometrial cancer, gestational diabetes, pre−eclampsia, polycystic ovary syndrome, erectile dysfunction, pain, diverticulitis, constipation, and gallbladder diseases

Booth FW, Roberts CK, Laye MJ. Lack of exercise is a major cause of chronic diseases. *Compr Physiol*. 2012; 2(2): 1143-211.

Mechanisms of CD

- Ancient mechanisms: Physical activity, insulin sensitivity and fat storage
- Inactivity: insulin sensitivity lost, fat storage increases

Eur J Appl Physiol (2008) 102:381–390
DOI 10.1007/s00421-007-0606-5

INVITED REVIEW

Reduced physical activity and risk of chronic disease: the biology behind the consequences

Frank W. Booth · Matthew J. Laye · Simon J. Lees · R. Scott Rector · John P. Thyfault

Accepted: 22 October 2007 / Published online: 7 November 2007

Abstract This review focuses on three preserved, ancient, biological mechanisms (physical activity, insulin sensitivity, and fat storage). Genes in humans and rodents were selected in an environment of high physical activity that favored an optimization of aerobic metabolic pathways to conserve energy for a potential, future food deficiency. Today machines and other technologies have replaced much of the physical activity that selected optimal gene expression for energy metabolism. Distressingly, the negative by-product of a lack of ancient physical activity levels in our modern civilization is an increased risk of chronic disease. We have been employing a rodent wheel-lock model to approximate the reduction in physical activity in humans from the level under which genes were selected to a lower level observed in modern daily functioning. Thus far, two major changes have been identified when rats undertaking daily, natural voluntary running on wheels experience an abrupt cessation of the running (wheel lock model). First, insulin sensitivity in the epitrochlearis muscle of rats falls to sedentary values after 2 days of the cessation of running, confirming the decline to sedentary values in whole-body insulin sensitivity when physically active humans stop high levels of daily exercise. Second, visceral fat increases within 1 week after rats cease daily running, confirming the plasticity of human visceral fat. This review focuses on the supporting data for the aforementioned two outcomes. Our primary goal is to better understand how a physically inactive lifestyle initiates maladaptations that cause chronic disease.

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Easier said than done?

Physical activity as medicine: time to translate evidence into clinical practice

Mai-Lis Hellénius,[1] Carl Johan Sundberg[2]

EDITOR'S CHOICE

Follow-up investigations of large cohorts of men and women in USA demonstrate that a low cardiorespiratory fitness constitutes the largest attributable fraction for all cause death.[1] These findings are highly relevant for a majority of populations all over the world. Sedentary lifestyle is a dangerous modern health threat. Physical inactivity is linked to almost all common health problems including cardiovascular diseases, type II diabetes, obesity/overweight, cancer, dementia and depression. Furthermore, the great value of physical activity in the prevention and treatment of disease has been proven over recent years. Physical activity is essential for improved health as well as for longevity. The last decade has also provided strong data that counselling on physical activity in healthcare is effective. A systematic literature review concluded that advice and counselling of patients in everyday clinical practice increased physical activity by 12–50% for at least 6 months after the counselling session.[2]

The prescription can be used for prevention and/or treatment. All healthcare professionals can prescribe physical activity. It is essential that the prescription be based on the individual situation and on a dialogue between patient and clinician. The written prescription is usually made on a special prescription form.

A Swedish study in primary healthcare on patients receiving physical activity on prescription demonstrated good adherence after 6 months. A majority of patients reported adhering fully to the prescription (65%). Partial adherence was reported by 19% and only 16% reported total non-adherence.[7] The results are encouraging given that many patients with chronic diseases have difficulties adhering to prescribed regimens in general.

ARE WE PREPARED?

There is an urgent need to spread new evidence on physical activity as well as evidence on how to promote physical activity. *Physical Activity in the Prevention and Treatment of Disease*, featured on the cover of this issue of *BJSM*, is a comprehensive handbook recently translated recommendations for physical activity in diseases and conditions within cardiovascular and metabolic medicine, psychiatry, orthopaedics, neurology, gastrointestinal medicine, nephrology, rheumatology, pulmonary medicine and more. The handbook is especially tailored to help health professionals prescribe physical activity. The method is currently used by well over half of all general practice units in Sweden; our international colleagues see no reason why that should not be the case in many parts of the world. The book (in English) is available for personal use from http://www.fyss.se as a pdf-file.

Acknowledgements M-LH is Board Member and CJS is chair of Professional Associations for Physical Activity, a sub-association of the Sports Medicine section of the Swedish Society of Medicine

Provenance and peer review Not commissioned; not externally peer reviewed.

Accepted 20 January 2011

Br J Sports Med 2011;**45**:158.
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REFERENCES

1. **Blair SN.** Physical inactivity: the biggest public health problem of the 21st century. *Br J Sports Med* 2009;**43**:1–2.
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3. **Lawton BA,** Rose SB, Elley CR, *et al.* Exercise on prescription for women aged 40-74 recruited through primary care: two year randomised controlled trial. *BMJ* 2008;**337**:a2509.

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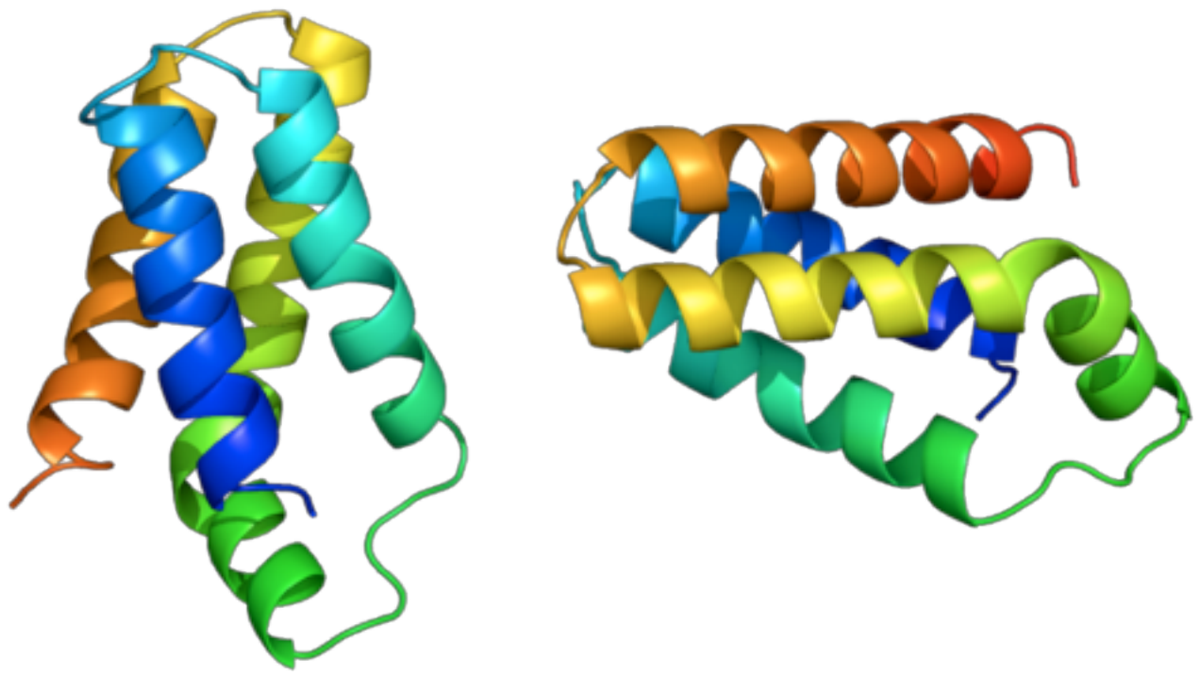
mTOR

- mTOR: energy and nutrient-sensing kinases that regulate cell growth, cell proliferation, cell motility, cell survival, protein synthesis, and transcription



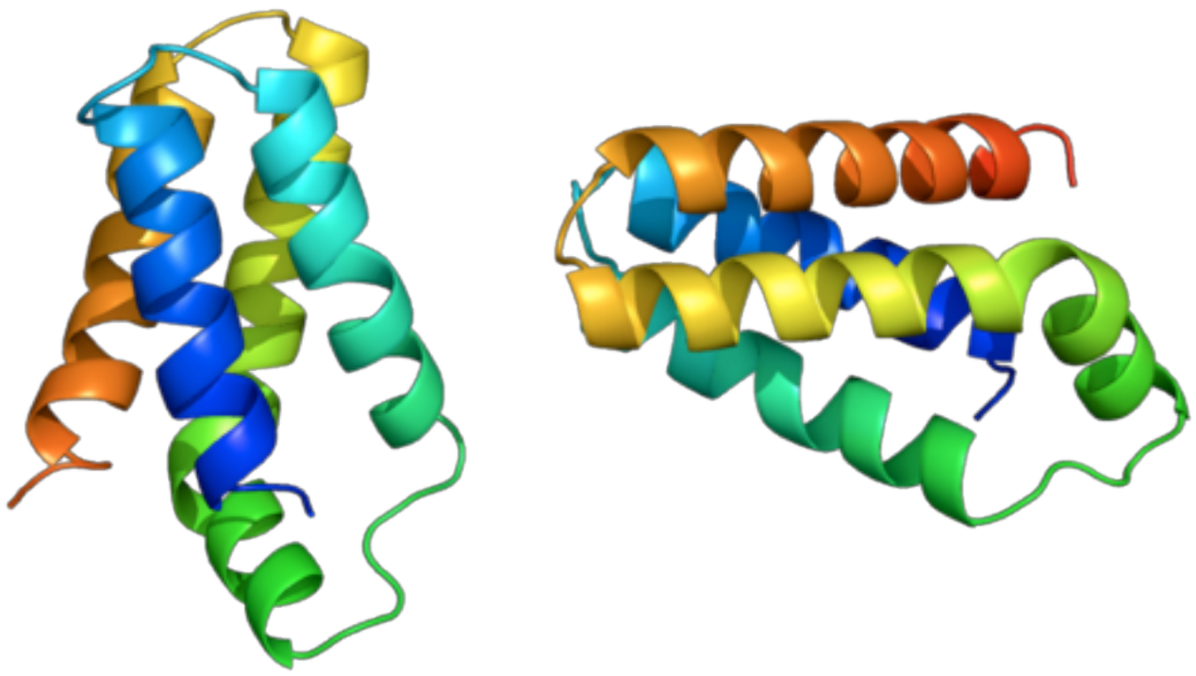
James J. Gibbons, Robert T. Abraham, and Ker Yu. *Seminars in Oncology*. 2009; 36(6), Suppl 3, pp S3-S17

mTOR

- mTOR: energy and nutrient-sensing kinases that regulate cell growth, cell proliferation, cell motility, cell survival, protein synthesis, and transcription

- Mammalian Target of Rapamycin

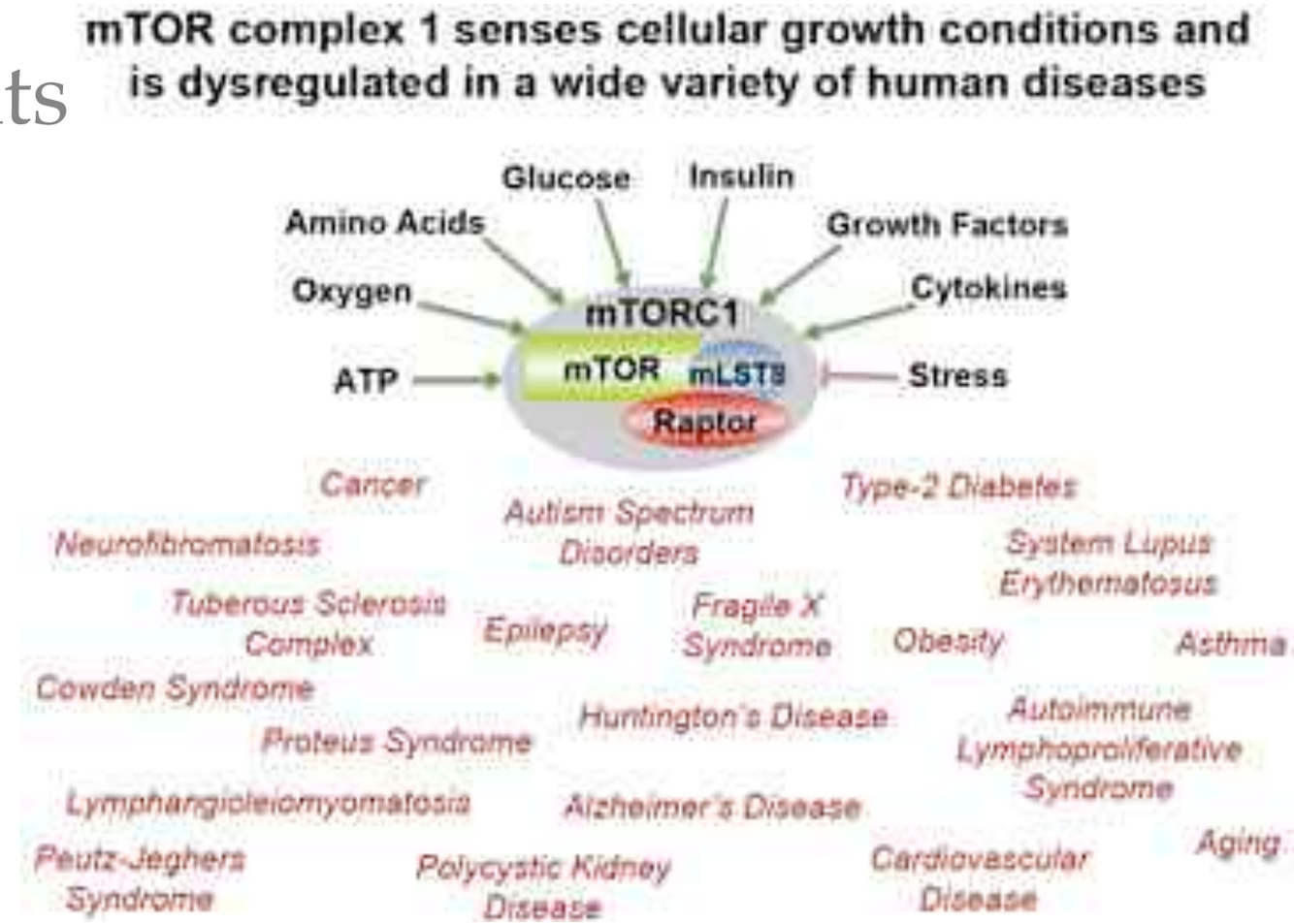
- Complex 1 and 2



James J. Gibbons, Robert T. Abraham, and Ker Yu. *Seminars in Oncology*. 2009; 36(6), Suppl 3, pp S3-S17

mTORC1

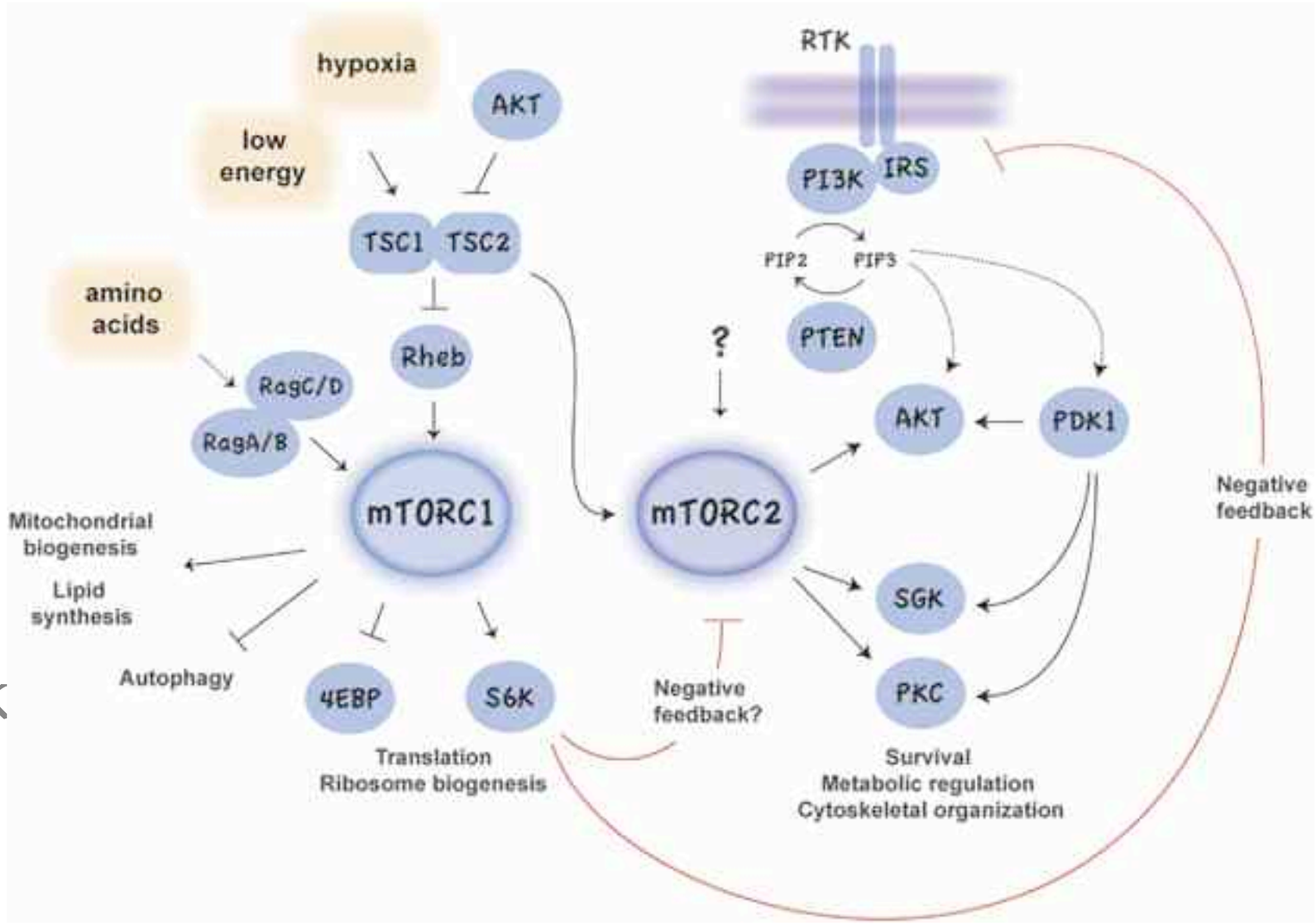
- Upregulated by nutrients and insulin; downregulated by CR and rapamycin
- "master controller" of protein synthesis
- Glucose & lipid catabolism



Wullschleger S, Loewith R, Hall MN. TOR signaling in growth and metabolism. *Cell*. 2006 Feb 10;124(3):471-84.

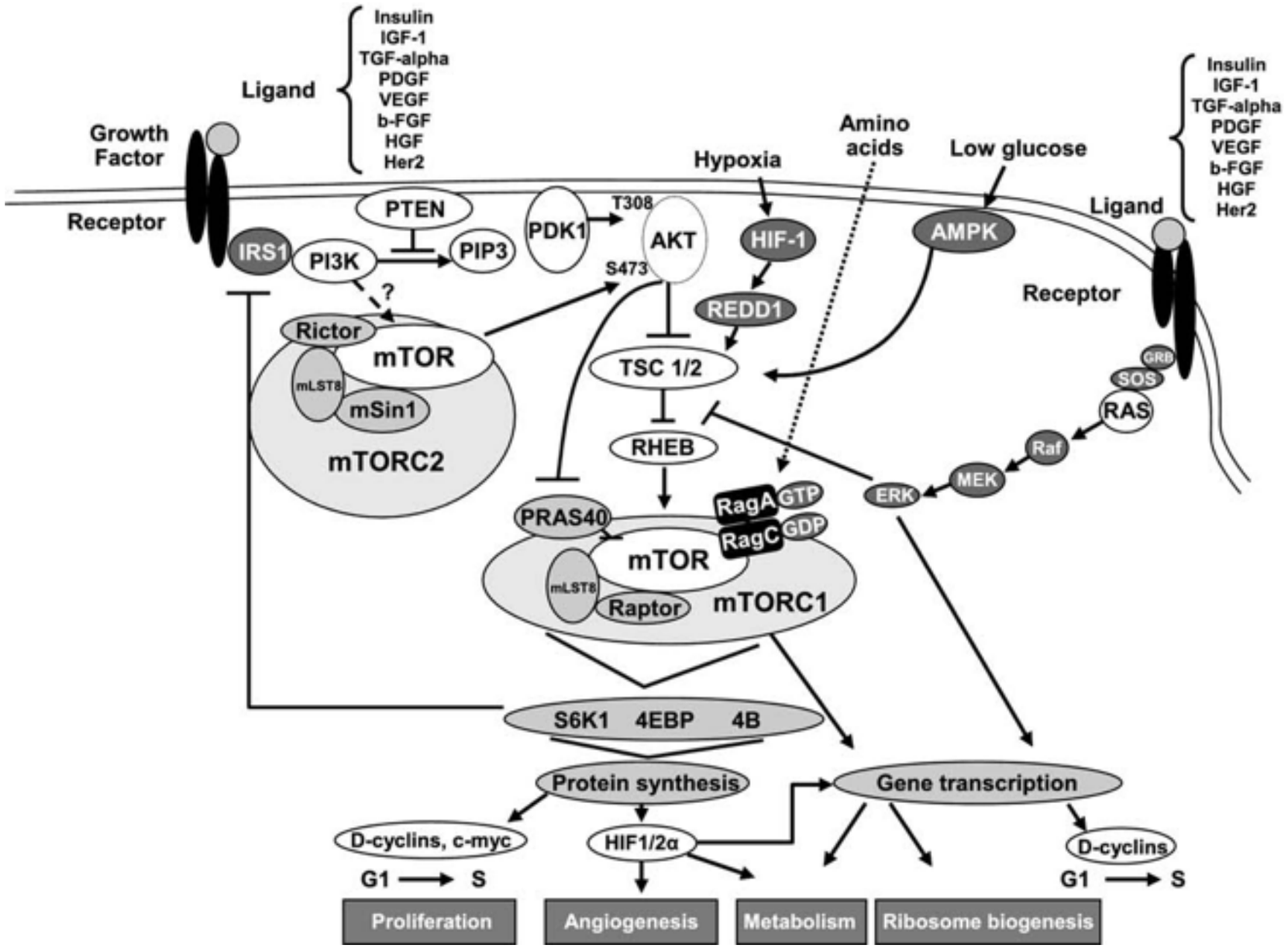
mTORC2

- Not inhibited by rapamycin
- Less understood
- Vital functions
- Negative feedback



C A Sparks and D A Guertin. Targeting mTOR: prospects for mTOR complex 2 inhibitors in cancer therapy. *Oncogene*. 2010; 29: 3733-3744.

mTOR signalling pathways



James J. Gibbons, Robert T. Abraham, and Ker Yu. *Seminars in Oncology*. 2009; 36(6), Suppl 3, pp S3-S17

AMPK signalling

- AMPK: nutrient-sensing, "metabolic master switch" for fuel homeostasis: cellular uptake of glucose, the β-oxidation of fatty acids, biogenesis of GLUT4 and mitochondria
- Responsive to AMP:ATP ratio that take place during rest and exercise (muscle stimulation)

Thomson DM, Porter BB, Tall JH, Kim HJ, Barrow JR, Winder WW. Skeletal muscle and heart LKB1 deficiency causes decreased voluntary running and reduced muscle mitochondrial marker enzyme expression in mice. *Am J Physiol Endocrinol Metab*. 2007; 292(1): E196-202.

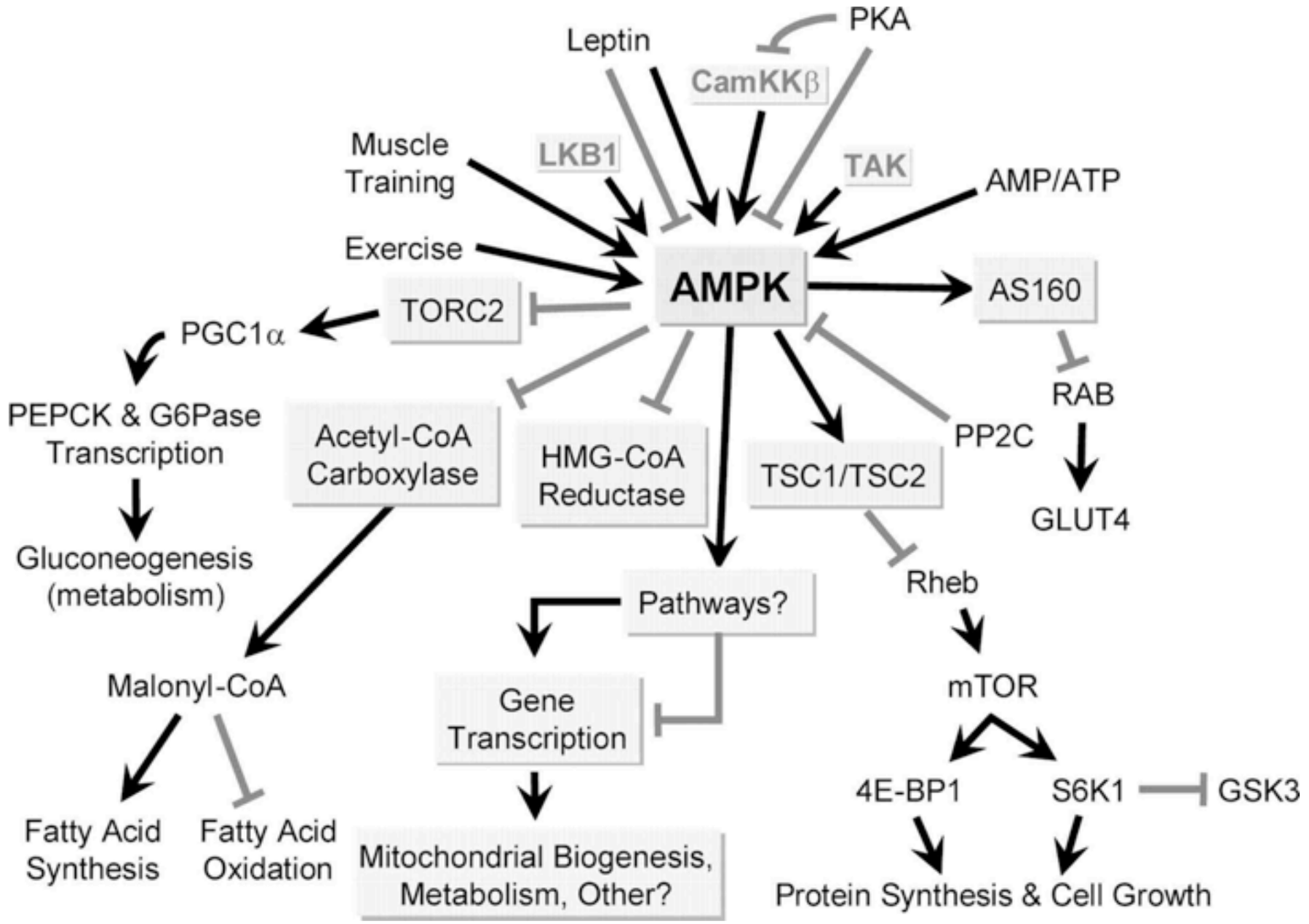
AMPK functions

Turns on catabolic pathways to restore ATP levels:

- Short-term: promoting glycolysis and fatty acid oxidation
- Long-term: ↑mitochondrial content and use of mitochondrial substrates as an energy source

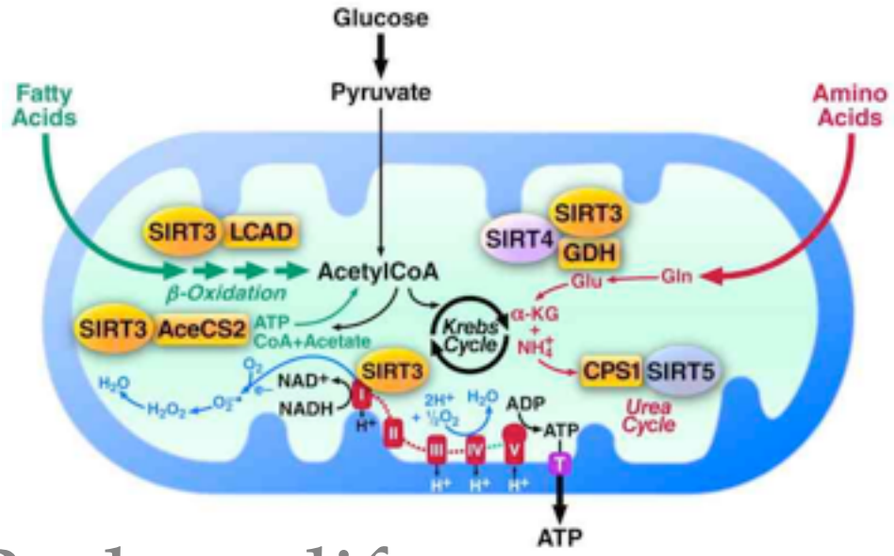
Cantó C, Auwerx J. Calorie restriction: is AMPK a key sensor and effector? *Physiology (Bethesda)*. 2011; 26(4): 214-24.

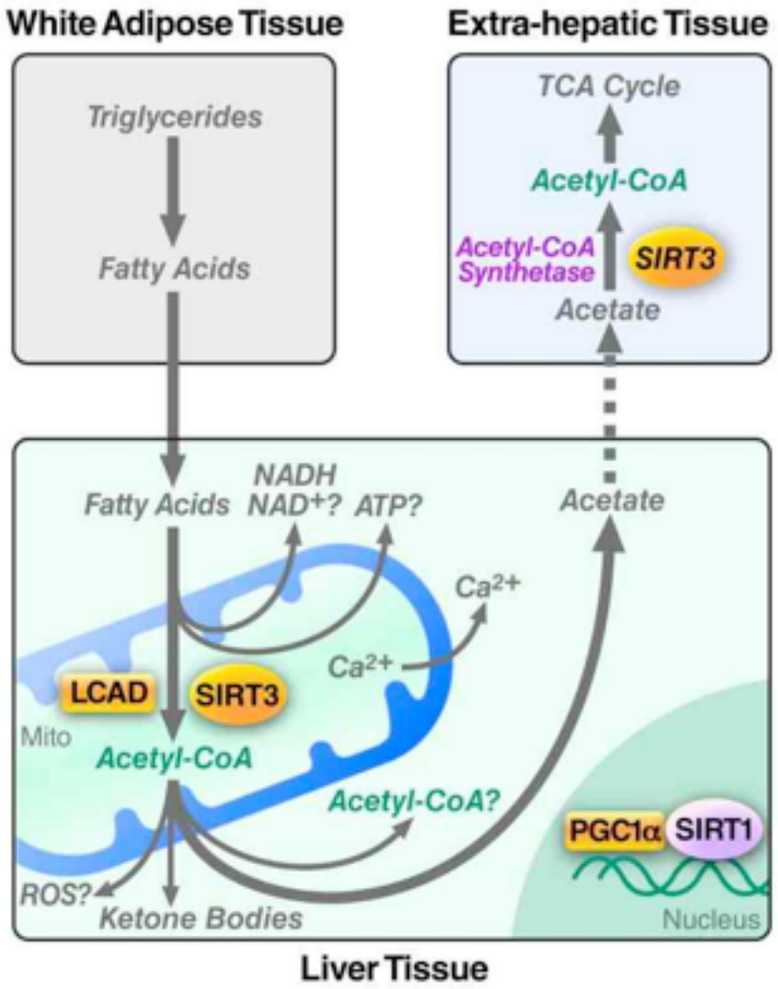
mTOR / AMPK network



Beale EG. 5'-AMP-activated protein kinase signaling in *Caenorhabditis elegans*. *Exp Biol Med*. 2008; 233(1): 12-20.

Sirtuin 'family'





- Prolong lifespan
- Modulate metabolic & stress response pathways
- Mitochondria: energy production, metabolism, apoptosis and intracellular signaling

Verdin E, Hirschey MD, Finley LW, Haigis MC. Sirtuin regulation of mitochondria: energy production, apoptosis, and signaling. *Trends Biochem Sci.* 2010; 35(12): 669-75

NOS modulation

- Neuronal NOS (nNOS): brain focus and muscle contraction (need ↑)
- Inducible NOS (iNOS): promotes inflammation and produces harmful free radical actions (need ↓)
- Endothelial NOS (eNOS): dilation of blood vessels, glucose uptake, and activation of muscle mitochondria energy utilization (need ↑)

Song W, Kwak HB, Kim JH, Lawler JM. Exercise training modulates the nitric oxide synthase profile in skeletal muscle from rats. *Journal of Gerentology. Biological Sciences.* 2009; 64(5): 540-549.
Buchwalow IB, Minin EA. Samoilova VE, et al. Compartmentalization of NO signaling cascade in skeletal muscles. *Biochem Biophys Res Commun.* 2005; 330: 615-621.
Gielen S, Adams V, Mobius-Winkler S, et al. Anti-inflammatory effects of exercise training in skeletal muscle of patients with chronic heart failure. *J Am Coll Cardiol.* 2003; 42: 861-868.

What do we want?

- ↓ mTOR
- ↓ IGF-1
- ↑ AMPK
- ↑ SIRTs
- ↑ nNOS and eNOS
- ↓ iNOS

How do we do it?

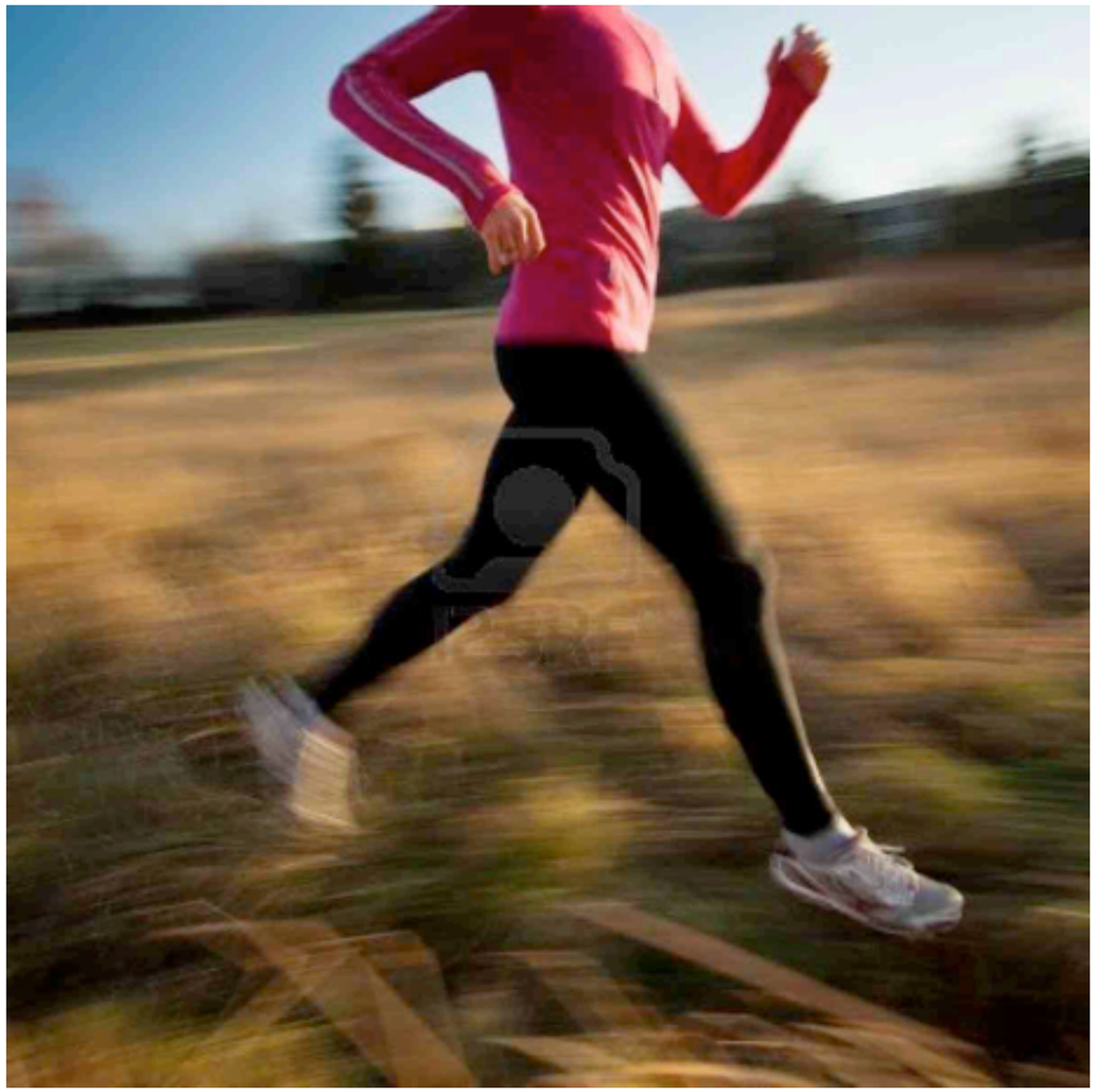
CR guidelines/options

- 25% reduced energy intake
- 18 h fasts 2-3 times week
- 12 h fasts 6 days/week
- Alternate day fasting (<600kcal/day on fast days)
- 5:2 intermittent fasting

Prof Valter Longo, USC

Michael Moseley, 'Fast Diet'

Resistance vs Cardio



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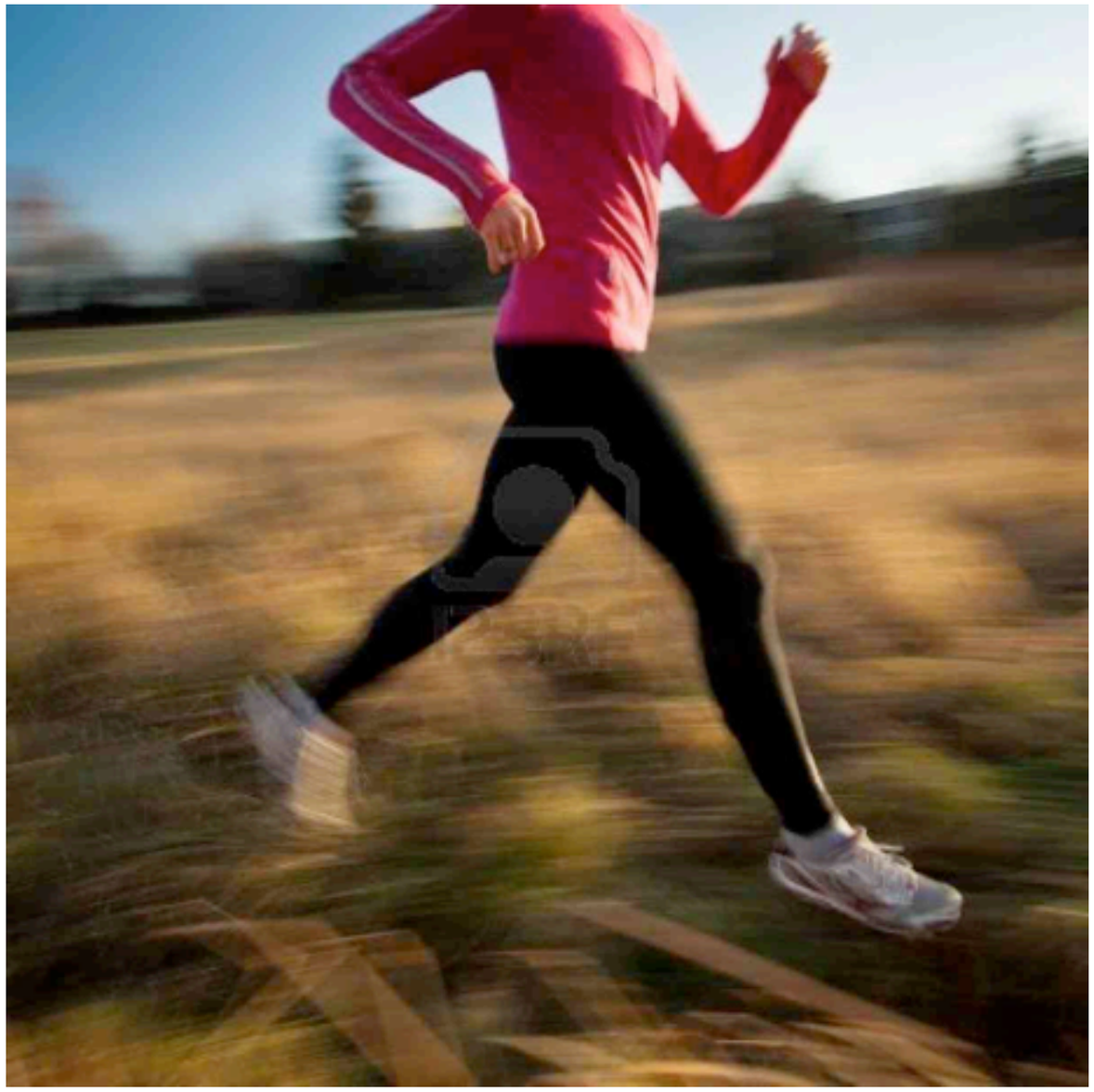
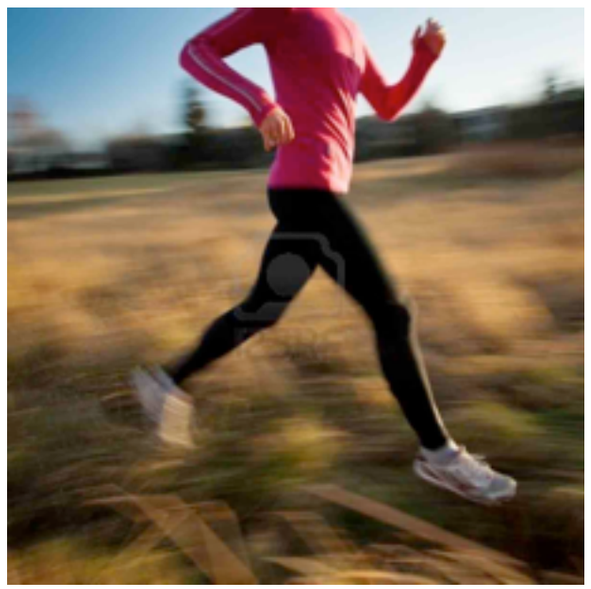


Training order: reasoning

- Aerobic fuels: glycogen or fat
- Anaerobic fuels: glycogen or muscle
- Resistance first, cardio after
- Or different days (or at least 6h apart)



Food choices/frequency

Food choices/frequency

1. Always maintain >5h between any meal

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2. Drink only water between meals

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2. Drink only water between meals
3. Eat protein at start of each meal

Food choices/frequency

1. Always maintain >5h between any meal
2. Drink only water between meals
3. Eat protein at start of each meal
4. Remove/minimise starchy carbs (i.e. go low-GL)

Food choices/frequency

1. Always maintain >5h between any meal
2. Drink only water between meals
3. Eat protein at start of each meal
4. Remove/minimise starchy carbs (i.e. go low-GL)
5. Minimise protein and fat damage from cooking

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6. Maintain phytonutrient spectrum

Eat a Rainbow of Healthy Foods

ORANGE

Foods

- Acorn squash
- Apricots
- Bell pepper
- Butternut squash
- Cantaloupe
- Carrots
- Dried fruit (apricot, mango, papaya)
- Mango
- Nectarine
- Orange
- Papaya
- Persimmons
- Pumpkin
- Sweet potato
- Tangerines
- Tea (orange infused)
- Turmeric root

Benefits

- Anti-cancer
- Anti-bacterial
- Immune health
- Cell protection
- Reduced mortality
- Reproductive health
- Skin health
- Source of vitamin A

YELLOW

Foods

- Apple (Golden Delicious)
- Asian pears
- Banana
- Bell peppers
- Corn
- Corn-on-the-cob
- Ginger root
- Greens
- Kale
- Lemon
- Pineapple
- Potatoes (Yukon)
- Spinach
- Starfruit
- Succotash

Benefits

- Anti-cancer
- Anti-inflammatory
- Cell protection
- Cognition
- Eye health
- Heart health
- Skin health
- Vascular health

GREEN

Foods

- Apples
- Artichoke
- Asparagus
- Avocado
- Bamboo sprouts
- Bean sprouts
- Bell Peppers
- Bitter melon
- Bok choy
- Broccoli
- Broccolini
- Brussels sprouts
- Cabbage
- Celery
- Cucumbers
- Edamame/Soy beans
- Green beans
- Green peas
- Green tea
- Greens (beet, chard/swiss chard, collard, dandelion, kale, lettuce, mustard, spinach, turnip)
- Limes
- Okra
- Olives
- Pears
- Rosemary
- Snow peas
- Watercress

Benefits

- Anti-cancer
- Anti-inflammatory
- Brain health
- Cell protection
- Skin health
- Hormone balance
- Heart health
- Liver health

RED

Foods

- Adzuki beans
- Apples
- Applesauce
- Bell Peppers
- Cranberries
- Cherries
- Grapefruit (pink)
- Goji berries
- Grapes
- Kidney beans
- Onions
- Plums
- Pomegranate
- Potatoes
- Radicchio
- Radishes
- Raspberries
- Shrimp
- Strawberries
- Sweet red peppers
- Rhubarb
- Rooibos tea
- Tomato

Benefits

- Anti-cancer
- Anti-inflammatory
- Cell protection
- DNA health
- Immune health
- Prostate health
- Vascular health

WHITE/TAN

Foods

- Apples
- Bean dips
- Cauliflower
- Cinnamon
- Clove
- Coconut products
- Coffee
- Dark chocolate
- Dates
- Flaxseed meal
- Garlic
- Legumes (hummus, dried beans or peas, lentils, chickpeas, peanuts)
- Lychee
- Mushrooms
- Nuts
- Onions
- Pears
- Refried beans (low-fat)
- Sauerkraut
- Sesame seeds
- Shallots
- Soy
- Tahini
- Tea (black, white)
- Whole flaxseeds
- Whole grains

Benefits

- Anti-cancer
- Anti-inflammatory
- Cell protection
- Gastrointestinal health
- Heart health
- Hormone health
- Liver health

BLUE/PURPLE

Foods

- Bell pepper
- Berries (blue, black, boysenberries, huckleberries, marionberries)
- Cabbage
- Carrots
- Cauliflower
- Eggplant
- Figs
- Grapes
- Kale
- Olives
- Plums
- Potatoes
- Prunes
- Raisins
- Rice, (black or purple)

Benefits

- Anti-cancer
- Anti-inflammatory
- Cell protection
- Cognitive health
- Heart health
- Liver health

IFM

Energy Food Plan

Fueling Healthy Mitochondria

Include Super Foods Daily

Fats & Oils

Servings / day

2 T.....*Avocado*
8.....Olives, black or green
1 t.....Oils, cooking (*organic*): *Coconut (virgin)*, Ghee
1 t.....Oils, salad *(cold pressed, organic)*: *Extra virgin olive*

1 t.....Butter (2 t. whipped)
1½ T..Coconut milk, regular
3 T.....Coconut milk, light
2 T.....Half and half
1 T.....Pesto (Olive oil)
1 t.....Mayonnaise (no sugar)
1 T.....Salad dressing made with quality oils
1½ t...Earth Balance spread

1 t.....Oils, salad (*cold pressed, organic preferred*): Almond, Canola, Flax seed, Grapeseed, Safflower or Sunflower high oleic oil, Sesame, Walnut

1 serving = 45 calories, 5 g fat

Nuts & Seeds

Servings / day

6.....*Almonds*
6.....Cashews
3 T.....Coconut (unsweetened)
1 T.....Chia seeds
2.....Brazil nuts
5.....Hazelnuts
6.....Mixed nuts (50% peanuts)
½ T....Nut butters (1½ t)
10.....Peanuts
4.....Pecan Halves
2 T.....Flax seeds, ground
1 T.....Hemp seeds
1 T.....Pumpkin seeds
4.....Walnut halves
1 T.....Pine nuts
16.....Pistachios
1 T.....Sesame seeds
1 T.....Sunflower seed kernels
2 t.....Tahini (sesame paste)

1 serving = 45 calories, 5 g fat

Protein

Servings / day

1 oz...Fish (omega-3 rich: mackerel, *wild alaskan salmon*, sardines)
1 oz...Meat, grass fed (*beef, buffalo*, lamb)
3 T.....Miso
¼ c....Natto
1 oz...Poultry (skinless chicken)
½ c....Tofu, tempeh

Plant Protein: *(organic, non-GMO preferred)*
1 oz...Burger alternatives: mushroom, soy, veggie
1 oz...Soy foods: soy burgers, soy cheeses, soy dogs

Animal Proteins: *(lean cut, grass fed, organic preferred)*
1.....Egg or 2 egg whites
⅓ c....Egg substitute
½ oz..Cheese, hard
1 oz...Cheese, low-fat
¼ c....Cottage cheese, low-fat
1 oz...Feta cheese, low-fat
1 oz...Shellfish (omega-3 rich: halibut, herring, tuna)
1 oz...Meat (elk, venison, wild game)
1 oz...Poultry (turkey, Cornish hen)
¼ c....Ricotta cheese, low-fat

Protein Powder:
Check label for #grams/ scoop (1 protein serving = 7 g)

1 oz serving = 50-100 calories, 7 g pro

Non-starchy Vegetables

Servings / day

Arugula	Chard/Swiss chard	*Radicchio*
Asparagus	*Daikon*	Radishes
Bok choy (Chinese cabbage)	*Escarole*	*Sea vegetables*
	Eggplant	*Spinach*
Broccoflower	Greens (beet, *collard, kale, mustard,turnip*)	*Turmeric*
Broccoli		Vegetables, fermented
Broccoli sprouts	*Green tea*	*Watercress*
Brussels sprouts	*Kohlrabi*	
Cabbage	Okra	
Cauliflower	Onions	
Artichoke	Garlic	Scallions
Bamboo shoots	Dandelion greens	Shallots
Bean sprouts	Green beans	Snow peas
Beet greens	Horseradish	Sprouts
Bell peppers	Jicama	Squash (spaghetti, yellow, zucchini)
Carrots	Leeks	
Celery	Lettuce	Tomato
Cilantro	Mushrooms	Tomato juice (¾ c)
Chives	Parsley	Vegetable juice (¾ c)
Cucumbers	Peppers	Water chestnuts
Endive	Salsa	

1 Serving = ½ c cooked, 1 c raw, 10-25 calories, 5 g carb

Legumes

Servings / day

½ c....Edamame, steamed (green soybeans)
½ c....Cooked dried peas, beans, or lentils
¾ c....Bean soups
⅓ c....Hummus or other bean dips
½ c....Fat-free refried beans
½ c....Green peas

1 Serving = 110 calories, 15 g carbs, 7 g pro

Low-fat Dairy/Alternatives

Servings / day

8 oz...Buttermilk, nonfat or 1%
8 oz...Kefir, nonfat or 1%, plain, unsweetened
8 oz...Milks: cow, goat, sheep; nonfat or 1%
8 oz...Milk alternatives: nut, hemp, soy; unsweetened
3 T.....Sour cream, low-fat
6 oz...Yogurt, cow or soy (plain, non-fat, unsweetened)
½ c....Yogurt, greek (plain, non-fat or 1%, unsweetened)

1 Serving = 70-100 calories, 12 g carbs, 7 g pro

Low Glycemic Impact Recommendations

Choose unsweetened dairy only. Limit to 1-2 servings per day max

Starchy Vegetables

Servings / day

1 c.....Acorn squash, cubed
1 c.....Beets, cubed
1 c.....Butternut squash, cubed
⅓ c.....Plantain (½ whole)
½ md..Potato (purple, red, sweet, yellow)
½ c.....Potatoes, mashed
½ c.....Winter roots or squashes (acorn, butternut, parsnip, pumpkin, rutabagas, turnip)
½ md..Yam

1 Serving = 80 calories, 15 g carbs

Low Glycemic Impact Recommendations

Limit to 1-2 servings per day

Fruits (No sugar added)

Servings / day

1 sm..Apple
¾ c....*Blackberries*
¾ c....*Blueberries*
½ c....Applesauce
4.....Apricots, fresh
½.....Banana, med
3.....Dates or Figs
½.....Grapefruit
1.....Kiwi
1 c.....Melon
12.....Cherries
15.....Grapes
½ sm.Mango
1 sm..Nectarine
1 sm..Orange
1 c.....Papaya
1 sm..Peach
1 sm..Pear
½ .....Persimmon
1 sm..*Pomegranate*
1 c.....*Raspberries*
1¼ c..*Strawberries*
¾ c....Pineapple
2 sm..Plums
3 md .Prunes
2 sm..Tangerines
2 T.....Dehydrated fruit (no sugar)

1 Serving = 60 calories, 15 g carbs

Low Glycemic Impact Recommendations

Limit to 2-3 servings per day. Limit dried fruit and fruit juices

Gluten Free Grains

Servings / day

¾ c....Amaranth, cooked
⅓ c....Brown rice, all types
2.....Brown rice cakes
½ c....Buckwheat / Kasha, cooked
3-4.....Crackers, gluten free (nut, seed, rice)
½ c....Millet, cooked
½ c....Oats, cooked (rolled, steel cut)
½ c....Quinoa
¾ c....Teff, cooked

1 Serving = 75-110 calories, 15 g carbs

Low Glycemic Impact Recommendations

Short term: Consider removal Long term: Limit to 1-2 serving per day

Top 5 supplements

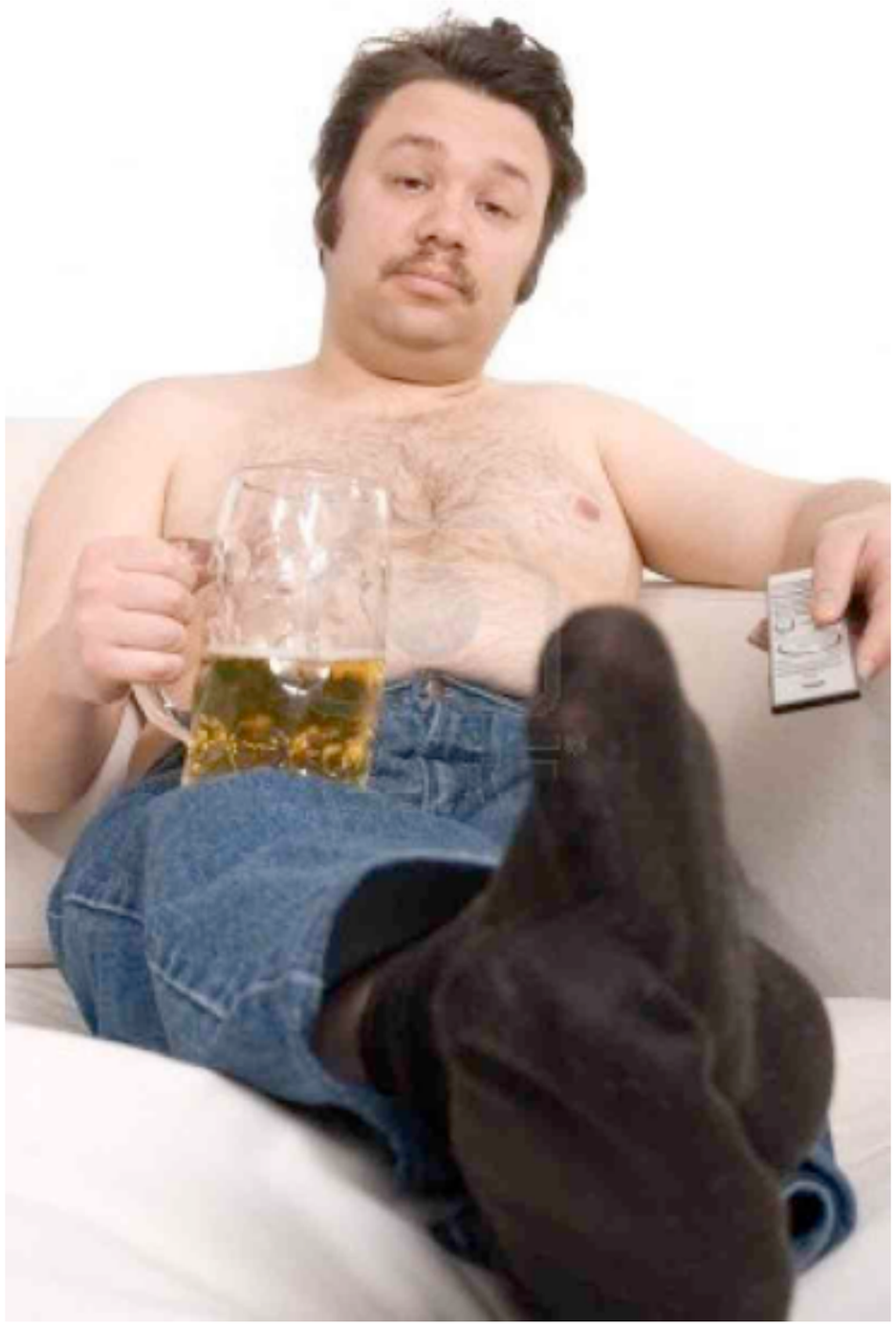
- Reveratrol (100-250 mg trans-rev /day)
- Curcumin (400-800 mg/day)
- CoQ10 (100-300 mg/day)
- Green tea (500 mg/day)
- B vitamins (RDA - 100 mg, B1,2,3,5,6; >1.5 mg reduced folate)

Others

Omega 3 FA & MUFA
Plant Sterols
Vitamin E, A, D, C & B's
R-lipoic acid
Grape seed extract
Ginger
Nettles
Quercetin
Rosemary
Magnesium

Fibre
Boswellia
Nattokinase
Dark Chocolate
Bromelain
Reduce Insulin resistance
Cold water fish
Flavonoids
CoQ10
Selenium

Rest vs sedentary behaviour



Rest vs sedentary behaviour

Rest vs sedentary behaviour

Physical activity options

- 1h daily of raised HR activity
- Minimum 7 h/week of moderate/ intense activity
- Don't compress activity into 1 or 2 days
- At least 1 day/week of endurance activity
- Exercise at end of o/night fast at least 2x / week

Long-term trend is key

Identify with one or forms of physical activity

Long-term trend is key

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Long-term trend is key

Identify with one or forms of physical activity

Set goals!

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Include 2 types of goal

- An **activity goal** e.g. running a half marathon, doing a 50-mile cycling sportive, climbing a mountain
- A **bodymetrics goal** e.g. losing 10 kg in 6 months, while gaining muscle mass (use body composition scales)

Go! Reset your endocrine/metabolic system!

- Stop eating (frequently)

- Be active (regularly)!

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