



Hacking the stress system: the stress response as an adaptive trait that can work for or against you


VIII - Lifestyle and stress I: Nutrition & Sleep



Nutrition



On the chaos that is Nutrition Science

- ▶ Everyone has their favourite diet and tests it against the standard American diet (MacDonald's, Burger king and worse).
 - ▶ Very few randomised trails
 - ▶ Extremely complicated to get people to follow a diet
 - ▶ Animal studies usually do not translate well
 - ▶ Mostly self-report data (highly unreliable)
 - ▶ Mostly aimed at the treatment of disease rather than optimum function
 - ▶ Heart disease, obesity, diabetes
 - ▶ With the exception of sport's science, longevity research
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What do we actually know about prehistoric diet?

- ▶ Atkins, paleo, raw, vegan, carnivore, keto ... ????
- ▶ We actually know surprisingly little
 - ▶ Generalist (all types of food stuffs)
 - ▶ An aim at digestibility
- ▶ But!!!! This diet was consumed in a highly physically active context!
 - ▶ Nutrition is partially about what else we are willing to do



Key nutrients

Macronutrients

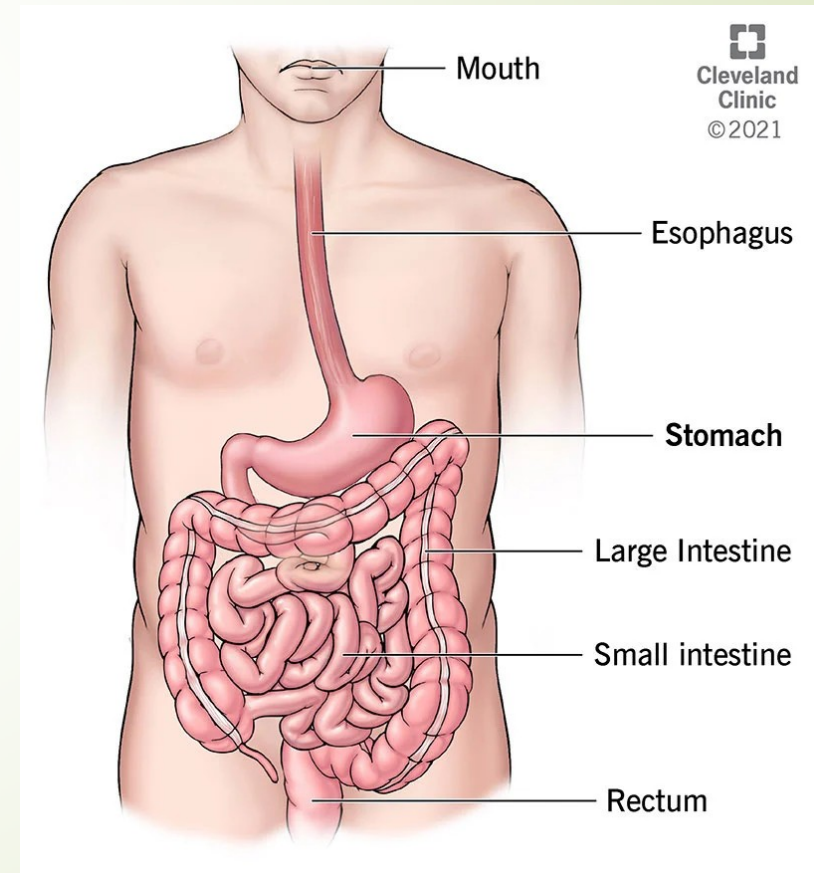
- ▶ Carbohydrates (4cal/gram)
- ▶ Protein (4cal/gram)*
- ▶ Fat (9cal/gram)*

Micronutrients

- ▶ Vitamins
- ▶ Minerals

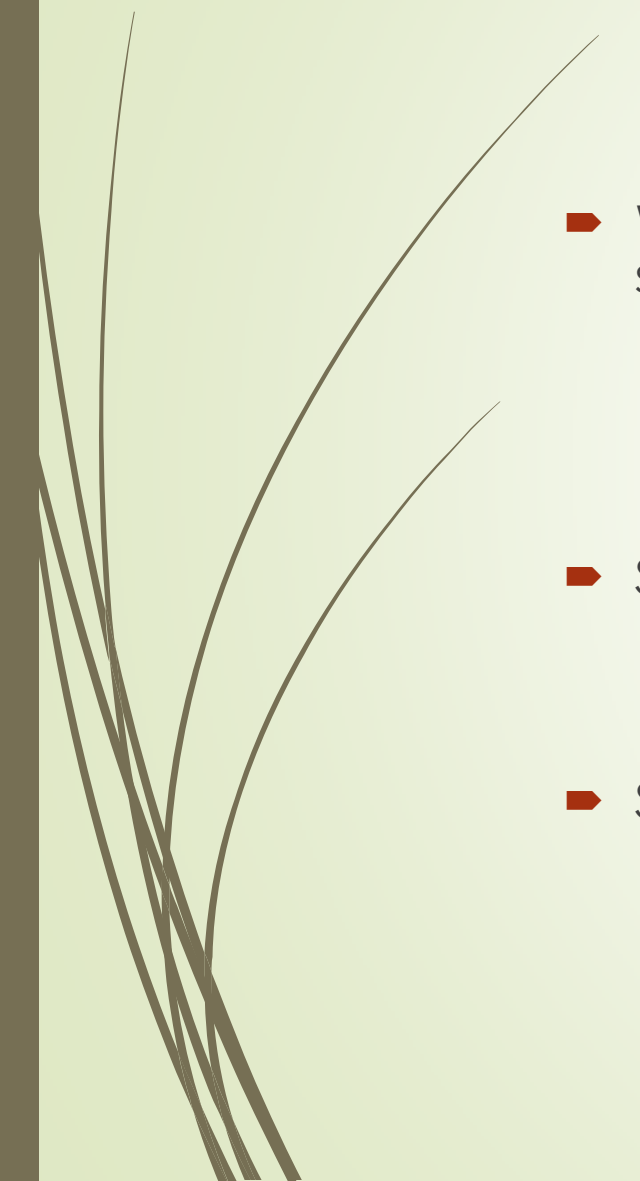
The digestive system has specific sensors for different nutrients

- ▶ Sugars
 - ▶ We like sweet things even if you numb taste buds
 - ▶ Stimulates endorphin secretion
- ▶ Amino acids (building blocks of protein)
 - ▶ We will eat until we have enough, not until we are full
 - ▶ L-tyrosine (dopamine precursor)
 - ▶ Chicken, turkey, fish, milk, yoghurt and almonds
- ▶ Fats (lipids)





The system simplified

- ▶ What you do not use, you store. But, not all macronutrients are stored the same way.
 - ▶ Insulin
 - ▶ Fat metabolism
 - ▶ Stress releases stored energy
 - ▶ Cortisol
 - ▶ Stress for no real reason
 - ▶ You dump a lot of energy on the system, remove it, dump it back in, remove it, etc.
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Fasting

- Autophagy
 - ketosis
- Longevity
- Regulation of insulin levels
- Neurogenesis



Mattson, M. P., Longo, V. D., & Harvie, M. (2017). Impact of intermittent fasting on health and disease processes. *Ageing Research Reviews*, 39, 46–58. <https://doi.org/10.1016/j.arr.2016.10.005>

Longo, V. D., Mitteldorf, J., & Skulachev, V. P. (2005). Opinion: Programmed and altruistic ageing. *Nature Reviews Genetics*, 6(11), 866–872. <https://doi.org/10.1038/nrg1706>

Sugar & insulin resistance a curse or an adaptive trait gone wrong

- Diabetes type 2
- Fatty liver disease
- Obesity
- Cognitive downregulation

Lustig, R. H. (2014). *Fat Chance: The Hidden Truth About Sugar, Obesity and Disease*. London: Fourth Estate Ltd.



Could insulin resistance be an adaptive trait?

- ▶ Many animals do not only start eating much more in preparation for winter but also change diet.
 - ▶ Fructose trigger
 - ▶ Higher consumption
 - ▶ Insulin resistance
 - ▶ Fat production
 - ▶ Cognitive downregulation
 - ▶ A response to prolonged periods of food shortage aimed at securing core functions



Johnson, R. (2022). *Nature Wants Us to Be Fat_ The Surprising Science Behind Why We Gain Weight and How We Can Prevent—and Reverse—It*-BenBella Books (2021). Dallas: Ben Bella Books, inc.



Sleep

When was the last time you were delusional?



On the importance of sleep

- ▶ Nature has not provided us with a means to store sleep. The sleep we do not get is lost.
 - ▶ Immune system
 - ▶ Sex hormones
 - ▶ Cognitive function

Almondes, K. M. de, Marín Agudelo, H. A., & Jiménez-Correa, U. (2021). Impact of Sleep Deprivation on Emotional Regulation and the Immune System of Healthcare Workers as a Risk Factor for COVID 19: Practical Recommendations From a Task Force of the Latin American Association of Sleep Psychology. *Frontiers in Psychology, 12*(May), 1–10. <https://doi.org/10.3389/fpsyg.2021.564227>

Garbarino, S., Lanteri, P., Bragazzi, N. L., Magnavita, N., & Scoditti, E. (2021). Role of sleep deprivation in immune-related disease risk and outcomes. *Communications Biology, 4*(1). <https://doi.org/10.1038/s42003-021-02825-4>


Lateef, O. M., & Akintubosun, M. O. (2020). Sleep and reproductive health. *Journal of Circadian Rhythms, 18*(1), 1–11. <https://doi.org/10.5334/jcr.190>

Su, L., Zhang, S. zheng, Zhu, J., Wu, J., & Jiao, Y. zheng. (2021). Effect of partial and total sleep deprivation on serum testosterone in healthy males: a systematic review and meta-analysis. *Sleep Medicine, 88*, 267–273. <https://doi.org/10.1016/j.sleep.2021.10.031>

Csipo, T., Lipecz, A., Owens, C., Mukli, P., Perry, J. W., Tarantini, S., ... Yabluchanskiy, A. (2021). Sleep deprivation impairs cognitive performance, alters task-associated cerebral blood flow and decreases cortical neurovascular coupling-related hemodynamic responses. *Scientific Reports, 11*(1), 1–13. <https://doi.org/10.1038/s41598-021-00188-8>



Stages of sleep: and their importance

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- Deep sleep
 - Delta waves / slow waves
 - Memory consolidation

 - Rapid Eye Movement sleep
 - Dream state
 - Memory contextualisation

Why sleep is so important

- ▶ Acute extreme sleep deprivation can
 - ▶ Be fatal
 - ▶ Lead to exacerbation of mental issues
 - ▶ Will lead to psychotic symptoms while sleep deprived
- ▶ Chronic sleep deprivation
 - ▶ Testosterone (a few nights of 4-5 hours – drop to levels of someone 10 years older)
 - ▶ Blood sugar dysregulation
 - ▶ Immune system failure
 - ▶ Effect on gene-expression
 - ▶ 1 night of 4 hours – a 70 % drop in natural killer cells
 - ▶ Alzheimer's