Alertness - Sleep - Nutrition

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NUTRITHÉRAPEUTE

Frequency of sleep disorders

- There is a reduction in the average sleep duration;
  - 1 hour over 50 years (in general) and 2 hours among teenagers: screens!
  - About **1/3 of the general population** experience sleep disorders

  (Kocevska *et al*., 2021 and Adjaye-Gbewonyo D. *et al*., 2022)

- Belgium:
  - In **Belgium: 36%** are affected by sleep disorders (study on 2323 Belgian citizens, Jan 2017, NewPharma)
  - 1/3 Belgians with sleep disorders (Royal Academy of Medicine) (1/4 from age 45 and 1/2 from age 60).

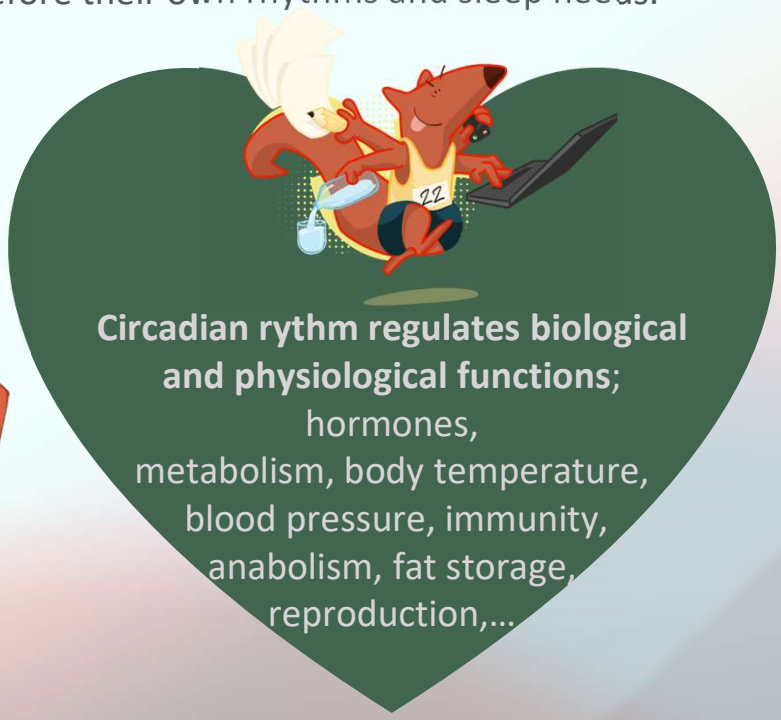
- France:
  - According to the INSV/MGEN 2023 survey (OpinionWay survey for INSV – 2023 sleep survey including 1004 people aged 18-65), **37% of French people** are dissatisfied with the quality of their sleep.

Kocevska D., Lysen T. S., Dotinga A., Koopman-Verhoeff M. V., Luijk M. *et al*., Sleep characteristics across the lifespan in 1.1 million people from the Netherlands, United Kingdom and United States: a systematic review and meta-analysis. Nat Hum Behav. 2021 Jan;5(1):113-122.

Adjaye-Gbewonyo D., Ng. A. E., and Black L.I. Sleep Difficulties in Adults: United States, 2020. *NCHS Data Brief* 2022, No. 436

What is sleep, chronobiology

- Internal clock located in the brain that conducts many peripheral clocks that adapt the rhythm locally in the body
- Imposes the circadian rythm of about 24h
- Everyone has their own internal biological clock (chronotype), and therefore their own rhythms and sleep needs. It varies with age, and is unequal for men, women and adolescents



Circadian desynchronization and lack of sleep can increase the risk of diseases and work accidents.

Adapted from Logan R.W. and McClung C.A. Rhythms of life: circadian disruption and brain disorders across the lifespan. Nature reviews Neurosciences, 2019, Vol 20, 49-65.
https://presse.inserm.fr/horloge-biologique-a-chaque-organe-son-rythme/30595/

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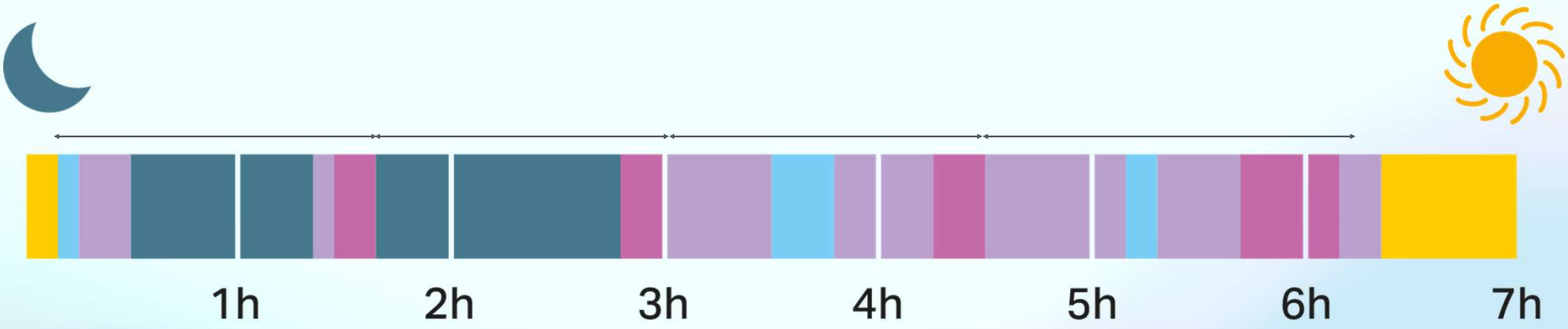
Understand sleep cycles

- The composition and structure of sleep vary from one individual to another and with age.
- A cycle lasts about 90 minutes (60 - 120 minutes).
- We go through between 3-5 cycles per night (see example with 4 arrows on the illustration).
- Recommended duration of sleep (18 - 64 years of age) per night: 7 – 9 h



Adapted from.Science & santé, INSERM, 2017, 35, 26-35

- Wake
- Transition wake-sleep (4 -5 %)
- Light slow sleep (45 – 55 %)
- Deep slow sleep (16 – 20 %)
- Paradoxical sleep (20 – 25 %)

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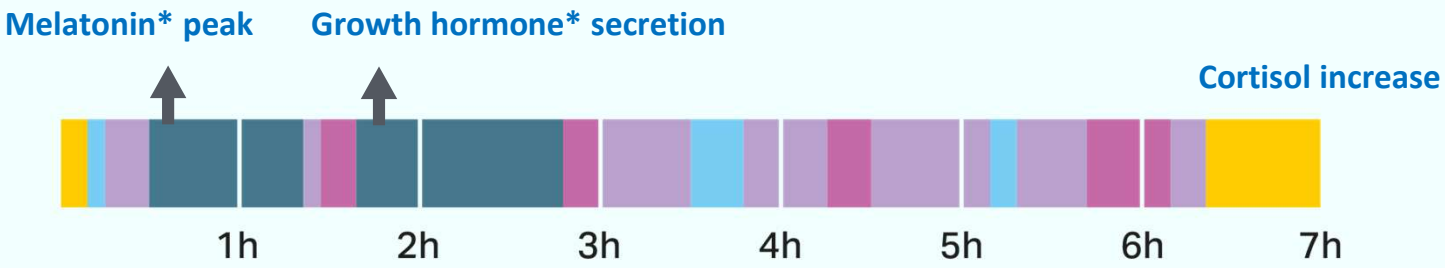

Deep slow sleep

- **Abundant at the beginning of the night**
- Slower brain activity
- Tissues renewal: action of growth hormone: **physical recovery**
- Knowledge memory of which we have recollections
- Storage of glucose in the liver
- Less abundant in the elderly and more abundant in teenagers

Paradoxical sleep

- Brief at the beginning of the night and **increases during the subsequent cycles**
- **Table of contents: memory** (library)
- Represents 80 % of a newborn's sleep

***Melatonin and growth hormone: described later in the presentation**

Adapted from.Science & santé, INSERM, 2017, 35, 26-35

The secretion rhythm of Melatonin is controlled by the internal clock. **Evening light exposure delays the biological clock and thus the production of melatonin** and the onset of sleep.

Morning light exposure, on the other hand, advances the clock.

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Sleep: we spend 1/3 of our lives sleeping

Physical and intellectual activity decreases:

the demand for glucose for the brain's basic metabolism is reduced by 44%;

the energy available in the brain increases.

Magnesium*:

- induces sleep,
- structures sleep,
- increase quality of the sleep,
- limits insomnia

Growth hormone*:

- Growth in children/adolescents
- anabolism in adults (muscle growth, reduction of fat mass).

- **Immune defenses,**
- **maintenance, restoration, repair (antioxidant, detox),**
- **growth (infants, children),**
- **physical recovery at the beginning of the night,**
- **memory repair (library).**

Melatonin*:

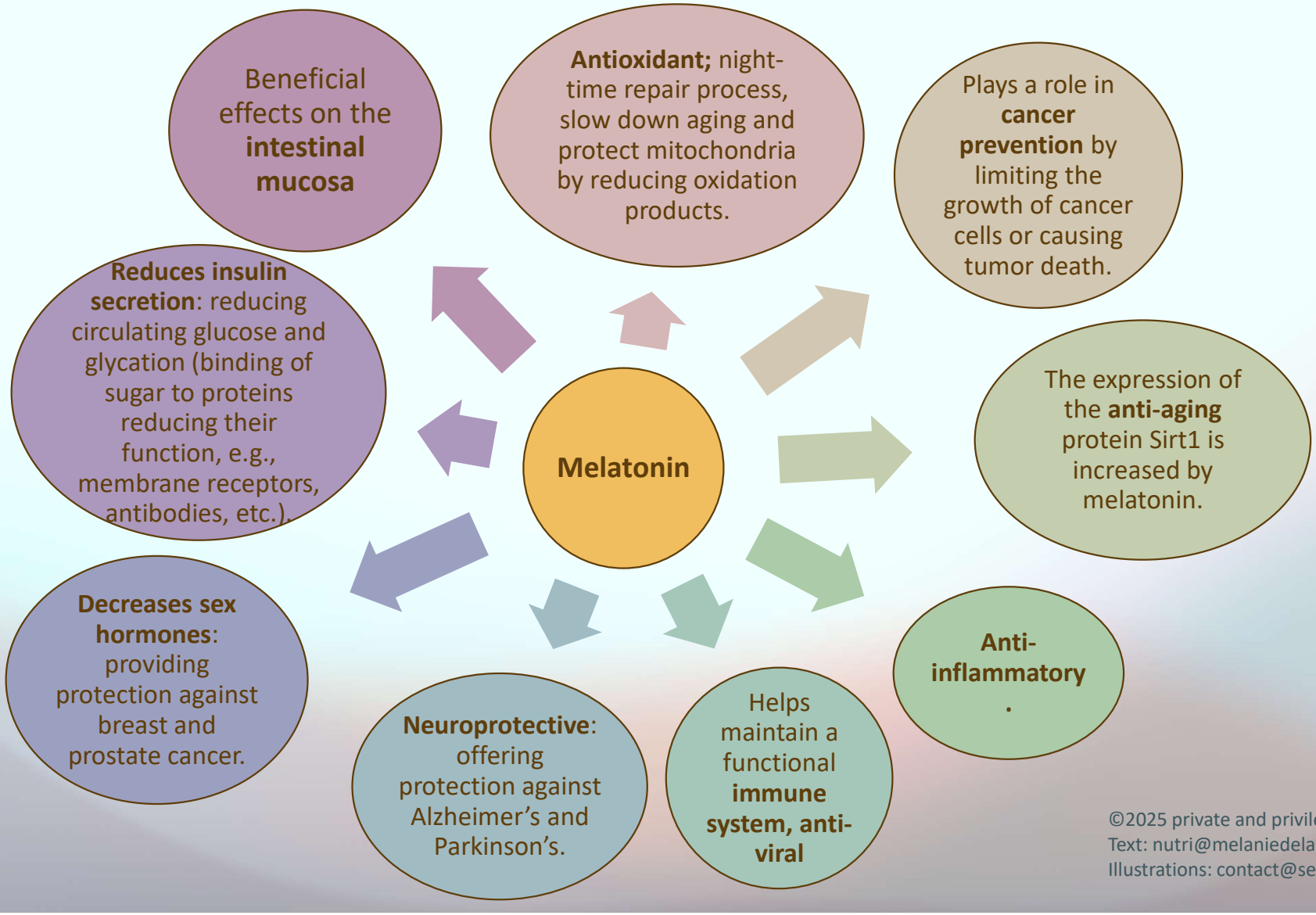
- The secretion rhythm of Melatonin is controlled by the internal clock
- Night-time repair process

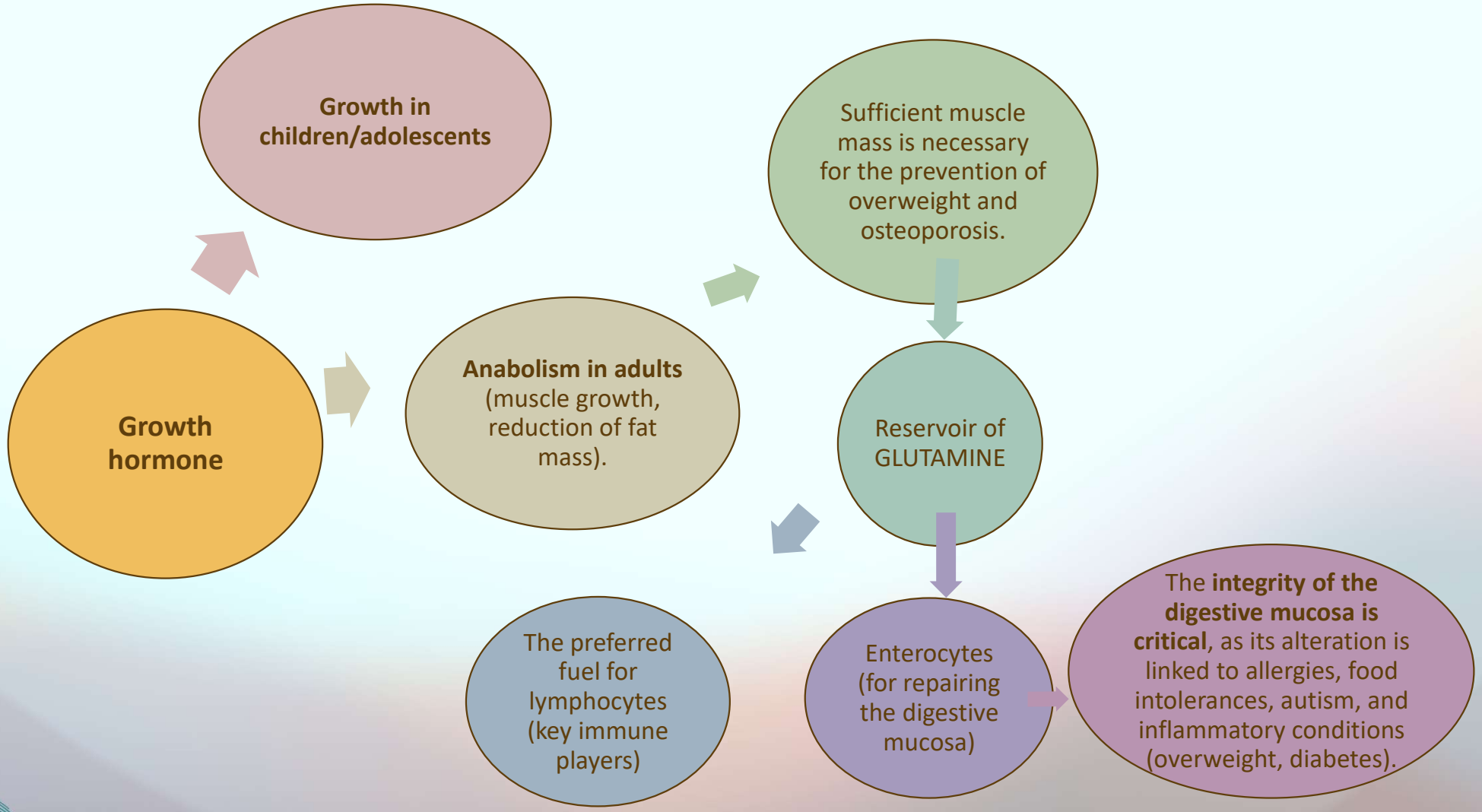
*Magnesium, Melatonin and growth hormone roles are described later in the presentation

Melatonin

- Melatonin is a **hormone produced from the amino acid tryptophan** (importance to eat proteins in the morning).
- It is mainly produced by the pineal gland, but also in other tissues, including the retina, the digestive system, the bone marrow, lymphocytes, the skin, and bone tissue.
- The secretion rhythm of this hormone is controlled by the internal clock. **External light can affect its production**. **Evening light exposure delays the biological clock** and thus the production of melatonin and the onset of sleep. Note that blue LED light (from televisions, computers, and mobile phones) activates the non-visual photosensitive receptors of the retina 70 times more than the white light of a fluorescent lamp of the same intensity. **Morning light exposure, on the other hand, advances the clock**. (Use f.lux application to program blue light reduction)

- When **melatonin levels rise, metabolism decreases, as does body temperature, blood pressure, and intestinal contractions, among others**.
- **Melatonin production decreases with age**, with a more pronounced decrease in women than in men. At the age of 5, it is about 170 pg/mL in the blood and less than 30 pg/mL at the age of 70, representing an 80 % reduction. Caloric restriction delays the decline in melatonin production typically observed with aging.





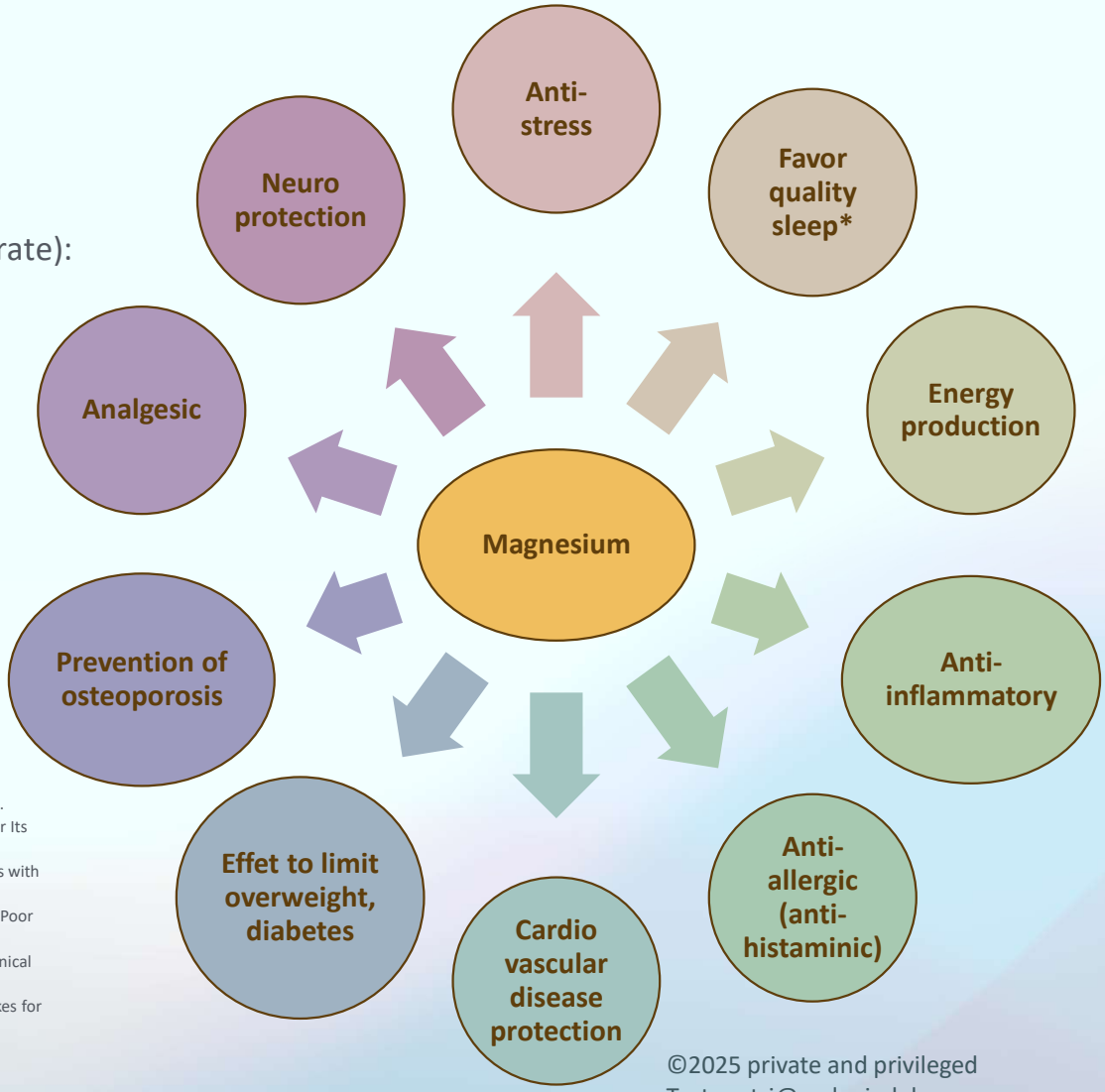
Magnesium: is a vital ion in the Body – it is time to consider its supplementation on a routine basis

Target 400 - 600 mg/day with glycerophosphate (or malate, citrate): split in the morning and in the evening

Note: without arginin in the composition if cancer.

Talk to your doctor for the contra-indications

The United States Food and Nutrition Board recommends a daily intake of 420 mg for men and 320 mg for women



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Magnesium is a vital ion in the Body – it is time to consider its supplementation on a routine basis

- Anti- stress (prohibits Ca entrance in the cell, modulates noradrenaline in the brain)
- Sleep: induces sleep (modulates noradrenalin, anti-histaminic, increases GABA receptor and reduces NMDA receptor), structures sleep, increase quality of the sleep (increase production of serotonin and melatonin) and limits insomnia (reduces cortisol)
- Energy production
- Anti-inflammatory (reduces white blood cell activation, limits entrance of iron in the cells),
- Anti-allergic (anti-histaminic),
- Roles in cardiovascular disease protection,
- Effect to limit overweight, diabetes,
- Prevention of osteoporosis,
- Neuroprotection,
- Analgesic

De Baaij, J.H.; Hoenderop, J.G.; Bindels, R.J. Magnesium in man: Implications for health and disease. Physiol. Rev. 2015, 95, 1–46.

Ákos Géza Peth´, Tibor Fülöp , Petronella Orosz and Mihály Tapolyai. Magnesium Is a Vital Ion in the Body—It Is Time to Consider Its Supplementation on a Routine Basis, *Clin. Pract*. 2024, 14, 521–535.

Magnesium is a vital ion in the Body – it is time to consider its supplementation on a routine basis

Causes of hypomagnesemia:

- Insufficient daily intake: 60% of adults do not achieve the average dietary intake (ADI). Content of essential minerals, including Mg^{2+}, in contemporary fruits and vegetables has declined by 80% or more compared to Mg2+ in produce grown in the early 20th century. Food Mg^{2+} is also reduced by modern processing methods.
- Increased excretion (coffee, stress, some medicines, excess of sugar and saturated fatty acids)
- Absorption inhibitors (Proton pump inhibitors (anti-acids): omeprazole, pandomed)
- Factors impacting metabolism: iron, estrogen level,…

Pitzer Mutchler A, Huynh L, Patel R, Lam T, Bain D, Jamison S, Kirabo A and Ray EC, The role of dietary magnesium deficiency in inflammatory hypertension. Front. Physiol. 2023. 14:1167904

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Andrea Rosanoff and Diriba B Kumssa. Impact of rising body weight and cereal grain food processing on human magnesium nutrition. *Plant Soil* 2020, 457, 5–23

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Insufficient sleep and its serious public health implications

Topic	References
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Sleepiness, Wakefulness, Vigilance, Accidents	Bougard, C., *et al.* (2014); Lim, J. *et al.* (2010); Paula Salo *et al.* (2012)
Risk of Cardiovascular Disease, Hypertension	Bertisch, S.M. *et al.* (2018); Grandner, M. A., *et al.* (2012); Ayas, N.T., *et al.* (2003); Janszky, I., *et al.* (2008); Schlafer, O., *et al.* (2014); Vgontzas, A.N., *et al.* (2009)
Cognitive Effects	Blackwell, T., *et al.* (2006); Maric, A., *et al.* (2017); Taveras, E.M., *et al.* (2007); Bocca, M.L., *et al.* (2006); Harrison, Y., *et al.* (1999); Beebe, D.W. (2011)
Obesity and Metabolism (biomarkers linked to Inflammation: IL-6 and IL-1 receptor antagonist)	Gangwisch, J.E., *et al.* (2005); Singh, M., *et al.* (2005); Logue, E.E., *et al.* (2014); Cespedes, E.M., *et al.* (2016); Markwald, R.R., *et al.* (2013); Schlafer, O., *et al.* (2014); Gupta, N.K., *et al.* (2002), Taheri, S., *et al.* (2004); Chaput, J.P., *et al.* (2014); Aho, V., *et al.* (2016), Shearer, W.T., *et al.* (2001); Dinges, D.F., *et al.* (1995).
Diabetes	Dutil, C., *et al.* (2017); Keckeis, M., *et al.* (2010); Capuccio, F.P., *et al.* (2010); Vgontzas, A.N., *et al.* (2009)
Immune System, Infection illness	Luciana, B. *et al.* (2012); Prather, A.A., *et al.* (2016)
Faster Aging	Cappuccio, F.P., *et al.* (2010); Grandner, M.A., *et al.* (2007); Spadafora, F.L., *et al.* (1996)
Cancer	Markt, S.C., *et al.* (2013); Kakizaki, M., *et al.* (2008); Thompson, C.L., *et al.* (2010); Wu, A.H., *et al.* (2008); Verkasalo, P.K., *et al.* (2005); Kolstad, H.A. (2008); Viswanathan, A.N., *et al.* (2007); Blask, D.E. (2009)
Depression, Burnout	Söderström, M., *et al.* (2018); Chen, M.C., *et al.* (2012); Howland, R.H. (2011); Okun, M.L., *et al.* (2011); O'Brien, E.M., *et al.* (2005); Catrett, C.D., *et al.* (2009); Coulombe, J.A., *et al.* (2010); Lund, H.G., *et al.* (2010); Roberts, R.E., *et al.* (2009)

Chattu, V.K.; Manzar, Md. D.; Kumary, S.; Burman, D., *et al.*, The global problem of insufficient sleep and its serious public health implications. *Healthcare* 2019, 7, 1-16.
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Grandner, M. A.; Jackson, N. J.; Pak, V.M.; Gehrman, P. R., Sleep disturbance is associated with cardiovascular and metabolic disorders. *J Sleep Res.* 2012, 21(4): 427–433.

British Journal of Cancer (2017) 116, 1239–1246 | doi: 10.1038/bjc.2017.85

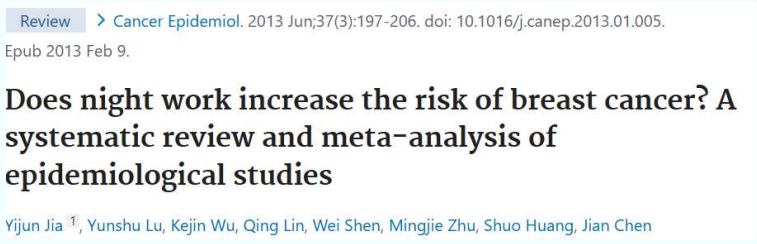
Keywords: sleep duration; sleep difficulties; breast cancer; diagnosis; survival; mortality

Sleep and survival among women with breast cancer: 30 years of follow-up within the Nurses' Health Study

Claudia Trudel-Fitzgerald[*,1], Eric S Zhou[2,3], Elizabeth M Poole[4], Xuehong Zhang[4,5], Karin B Michels[6], A Heather Eliassen[4,5], Wendy Y Chen[2,3,4], Michelle D Holmes[4,5], Shelley S Tworoger[4,5] and Eva S Schernhammer[4,5,7]

30 years follow up in 3682 nurses affected by breast cancer see mortality increase by 35% when sleep is affected

CLINICAL STUDY TO MENTION IN SLIDE - Trudel-Fitzgerald, C.; Zhou, E.; Poole, E. M.; Zhang , X.; Michels K. B; Eliassen, A.H.; Chen, W. Y.; Holmes M. D.; Tworoger, S.S.; and Schernhammer, E.S. Sleep and survival among women with breast cancer: 30 years of follow-up within the Nurses' Health Study. *British Journal of Cancer*, 2017, 116, 1239–1246.



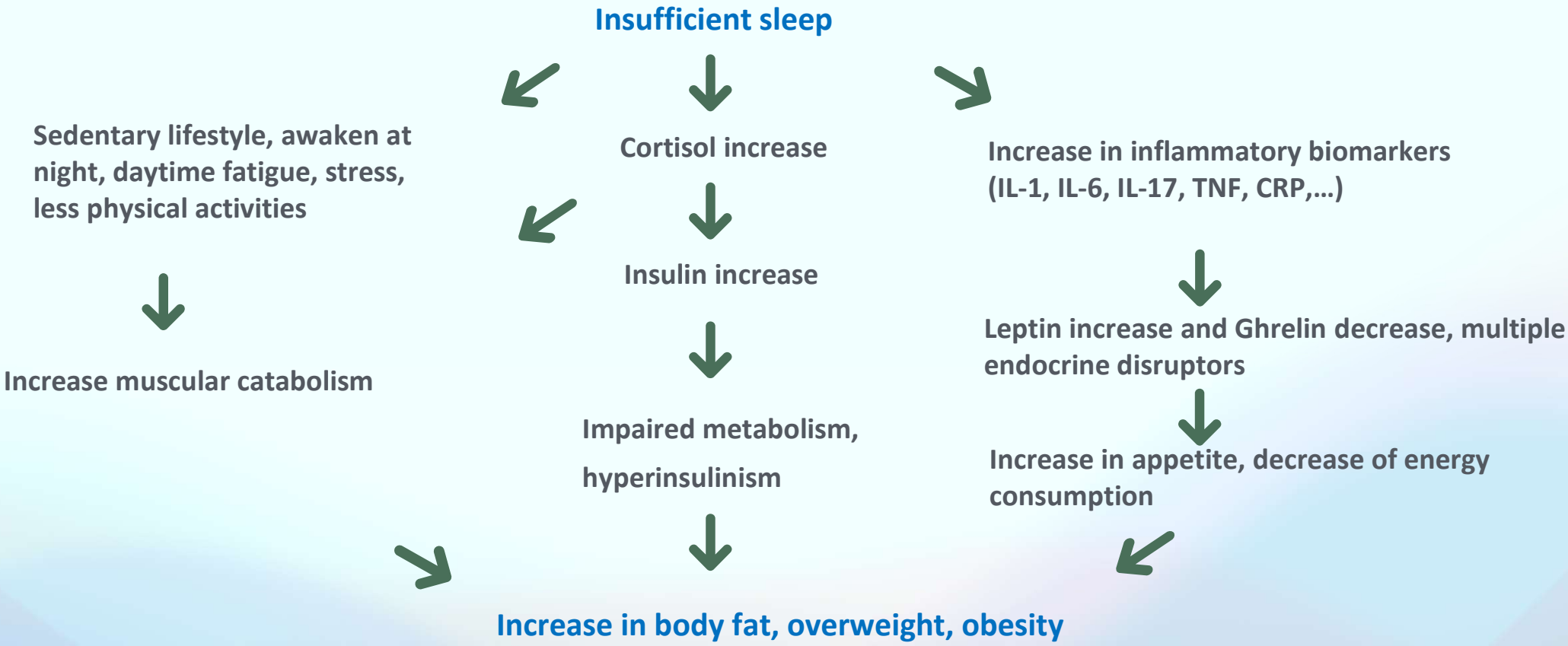
Review > Cancer Epidemiol. 2013 Jun;37(3):197-206. doi: 10.1016/j.canep.2013.01.005. Epub 2013 Feb 9.

Does night work increase the risk of breast cancer? A systematic review and meta-analysis of epidemiological studies

Yijun Jia [1], Yunshu Lu, Kejin Wu, Qing Lin, Wei Shen, Mingjie Zhu, Shuo Huang, Jian Chen

Women working nightshift have relative risk increase of breast cancer

Yijun Jia a,1 , Yunshu Lu a,1 , Kejin Wu a, *, Qing Lin b , Wei Shen b , Mingjie Zhu c , Shuo Huang a , Jian Chen. Does night work increase the risk of breast cancer? A systematic review and meta-analysis of epidemiological studies, Cancer Epidemiology 37 (2013) 197–206.



Adapted from Van Vlodorp P. Et al. 2017. Les erreurs qui vous empêchent de maigrir

Vitamin C

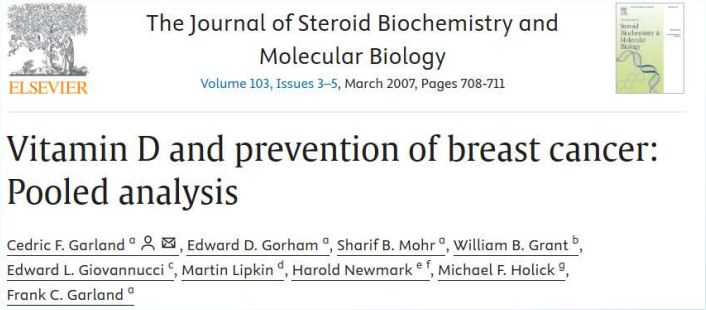
Act as anti-oxydant: protection of tissues, corrosive substances, free radicals produced during infection, increase immunity, anti-allergy

(125 mg/h during initial infection and otherwise every 3-4h)

Vitamin D (Vit D3)

Act as a hormone on almost all organs, on microbiome, act as antibiotic, anti-cancer (limit aging), act on intestine, muscles, bones

Ask doctor: blood analysis: target 50-60 ng/mL



Intake of 2000 IU/day of Vitamin D_3, and, when possible, very moderate exposure to sunlight, could raise serum 25(OH)D to 52 ng/ml, a level associated with reduction by 50 % in incidence of breast cancer, according to observational studies.

Considering the importance of the sleep, nutrition and alertness;

Let's go in practice with good habits to improve well being and health

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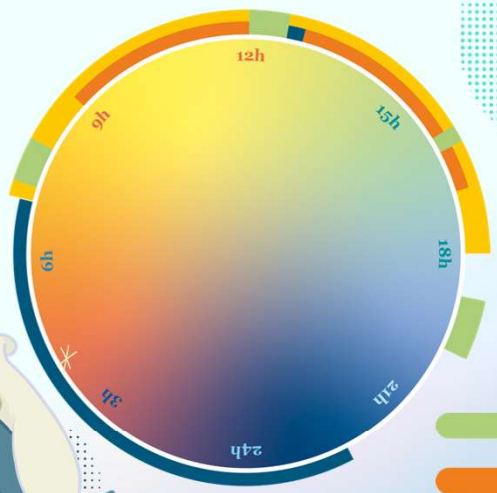
For all meals:

- Favor organic, local
- Home made
- Avoid industrial food
- Drink water during the day

Noradrenalin: energized, concentration

Dopamin: happiness



Serotonin: feeling of well-being, brake

Melatonin and growth hormone

MEAL
WORK
SLEEP
FRAME FOR ACTIVITY

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Dopamin (happiness)

Waking Up

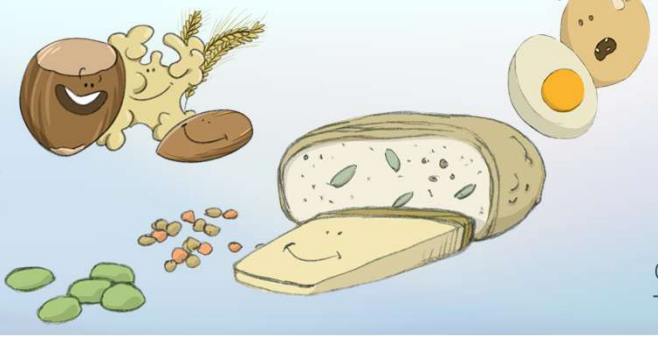
- Get up at a regular time
- Exposure to light
- Physical activity ideally in the morning or around midday

- Favor local, organic
- Homemade, avoid industrial food
- Drink water during the workday, aeration

Breakfast

- **Favor proteins** (*e.g*. meat, eggs, cheese, plant-based dairy products with chia, ground flaxseeds, berries...)
- **Avoid fast-acting sugars** (*e.g*. multigrain bread, gluten-free starches (quinoa, buckwheat, millet,...))
- Nuts, seeds rich in omega-3 stored in the fridge (*e.g*. hemp, chia, mixed flaxseed,...)
- 1 fruit, hot drink (*e.g*. green tea, matcha, infusion)
- Magnesium and Vitamin C

- *Proteins help produce dopamine (happiness) at the beginning of the day and serotonin at the end of the day (calm, serenity) and melatonin to sleep.*
- *It is necessary to limit fast-acting sugars because they are hypoglycemic and increase hunger quickly.*
- *Omega-3 fatty acids allow for better metabolism (e.g. increasing cell membrane flexibility).*
- *Green tea contains anti-inflammatory polyphenols (catechins: there are about 100 times more in matcha).*
- *Magnesium is essential for energy production, and vitamin C boosts immunity, and both are anti-allergic.*



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Intermittent fasting: « Brunch »: mix of breakfast and dinner

- **Duration without calorie intake** (13-16h (above 18 yoa and not for pregnant/lactating women)
- Body in state of **healthy stress** due to temporary nutrient deprivation
- Cellular cleaning, **longevity increase**, restorative (DNA and proteins), detoxification, boost of energy production, lower risk of obesity, diabetes and other diseases

To increase vigilance and circadian rythm

- Sport/physical activity during the day: favor morning-noon
- Drink water
- Aeration, breathing

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Noradrenalin: energized, concentration

Dinner

- Proteins: meat (local/organic, 1-2 x/week for women after menopause and men)

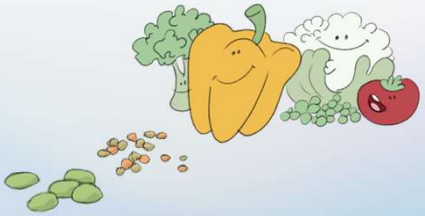


- Cook with olive oil and anti-inflammatory spices (avoid salt*)

Salt increases glucose intake, hypertensive, cardiovascular diseases. Favor anti-inflammatory spices such as turmenic, ginger, clove and fresh herbs,…

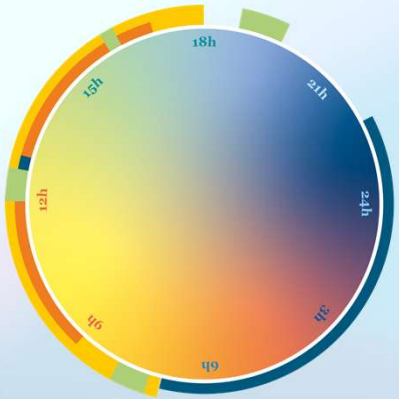
- Vegetables, legumes (*e.g*. lentils, beans,…) and mix of gluten free wheats (*e.g*. quinoa, buckwheat, millet,…)





Nap: max 30 min

Short naps (20–30 min) improve cognition, mood, and cardiovascular health, while longer naps may be risky, especially for those with sleep difficulties, and require an individualized approach.



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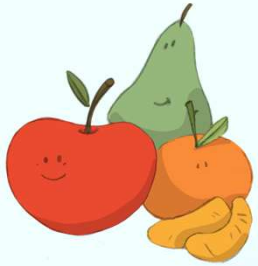
Serotonin: feeling of well-being, brake

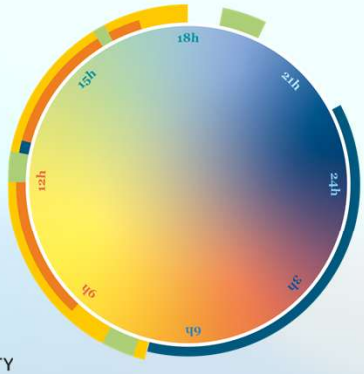
Around 15:00

- Stop drinking coffee and tea,
- Favor infusion, water

Snack

- Favor fruits,
- Nuts, oilseeds,
- Dark chocolate (min 74%)





MEAL
WORK
SLEEP
FRAME FOR ACTIVITY

Importance of a snack

- Limit the food intake during supper,
- Favors sleep,
- Serotonine: relax, emotions

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Melatonin and growth hormone

Supper

- 2h before sleep, eat less, chew slowly, avoid meat
- Favor vegetables and low acting sugars (*e.g.* gluten free wheats, rice, pasta)
- Magnesium, Vit D

Before sleep

- Avoid warm bath
- Avoid dynamic activities
- Avoid alcohol (impact on quality of the sleep)
- Avoid screen (blue light)
- Avoid stressful activities or discussions, and intense intellectual work that keeps the brain alert.
- Bed: good quality, T18°C, cover feet, dark bedroom
- Go to sleep at regular hours

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