Food for Brain and Brain Health

The interaction between food and brain health

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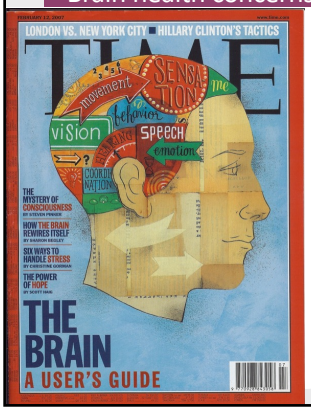
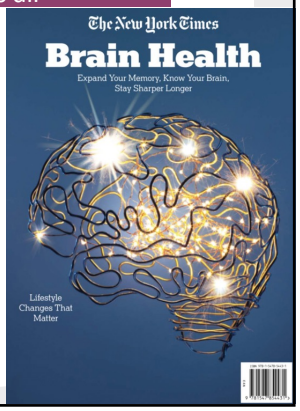
Brain health concerns us all





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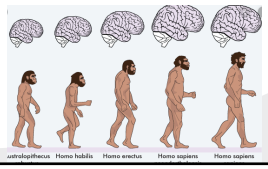
Evolution of the brain

- The brain is our central control organ: vital and non-transplantable
- It enables language, memory, tools, symbols, social life, self-awareness, emotion, mind, … : it makes us who we are.

- Brain volume ×3 in ~3 million years: ≈450 cm³ (Australopithecus) → ≈1,350 cm³ (Homo sapiens)
- More energy, fat and protein in the diet made a bigger brain possible.



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Evolution of the brain and food

- Diet shift: leaves, seeds and fruit → fish, seafood, eggs, game, … (hunter-gatherers)
- Fire and cooking (probably >1 million years ago): more energy from the same food; smaller teeth, jaws and gut: **slow** change
- Agriculture (~10,000–12,000 years ago): stable food supply, settled life, population growth: **fast** change

- Our brain evolved for a diet very different from today's supermarket shelves.

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Living longer: the brain challenge

- Life expectancy: ~45–50 years (1900) → 81.5 years in the EU (2024): better health care, education, housing, hygiene and food
- By 2050 almost **1 in 3** EU citizens will be 65+ (today 1 in 5).
- **3.4 billion** people (43% of the world) live with a nervous-system condition: the #1 cause of illness and disability.
- Dementia, epilepsy, head trauma, .. are potentially preventable by tackling modifiable risk factors.
- Brain Health: "No health without brain health"

- Yet food and brain are rarely studied together: room for hype and pseudo-science.

Eurostat; GBD 2021, Lancet Neurol 2024; Lancet Commission on dementia 2024

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How Belgium eats

- Too little vegetables (≥300 g/day): only **7%** of adults
- Too little fruit (250 g/day): only **10%**
- Too little water (≥1 L/day): only **40%**
- Too much red & processed meat than advised: **90%**
- Too much sugar, refined carbohydrates, saturated fat and alcohol



Sciensano, Food Consumption Survey 2022–2023

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Food for brain: water

- The brain is ~75% water; mild dehydration (≈2% of body weight) impairs attention, reaction time and mood.

- Belgian advice: 1–2 L of fluids a day, preferably (tap) water; food adds about 20%
- Older people feel thirst less: drink before you are thirsty.
- Limit sugary soft drinks; "functional" waters add no proven brain benefit.

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Food for brain: fats

- ~60% of the brain's dry weight is fat: cell membranes and myelin.
- Omega-3 (DHA) is a key building block of neurons; the body makes little of it, so it must come from food.
- Western diets: omega-6 : omega-3 ≈ 15–20 : 1 (ancestral diets ≈ 1–2 : 1)

- Best EPA/DHA sources: oily fish, fish roe and caviar; plant omega-3 (ALA): flaxseed, walnuts, chia, but with limited conversion
- Prefer unsaturated fats (olive oil, nuts) over saturated fats (fatty red meat, butter, cream).

EFSA: 250 mg EPA+DHA/day ≈ 1–2 portions of oily fish per week

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Food for brain: protein

- Proteins supply amino acids: the raw material for neurotransmitters.
  - tryptophan → **serotonin** (dairy, poultry, oats, seeds)
  - tyrosine → **dopamine** and **noradrenaline** (cheese, meat, fish, soy, peanuts)
  - **choline** → acetylcholine, memory (eggs, fish, legumes)
- Plant proteins count: soy, legumes and nuts also bring fibre and polyphenols.
- Older adults need more protein (≈1–1.2 g/kg/day) to stay strong and mobile.

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Food for brain: carbohydrates

- Glucose is the brain's main fuel: 2% of body weight, ~20% of our energy (≈120 g glucose/day).
- All digestible carbohydrates (starch, sugar, fructose, lactose) end up as glucose, mainly via the liver.
- What matters is a **steady** supply: whole grains, vegetables and whole fruit (**fibre** → slow release).
- Sugar peaks (sweets, soft drinks, juices) → obesity and type 2 diabetes, both dementia risk factors.
- Excess is stored as glycogen and body fat.

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Oily fish

- Rich in omega-3, EPA/DHA: building blocks of neuronal membranes, anti-inflammatory
- Eating fish 1–2×/week is associated with slower cognitive decline.
- Salmon, mackerel, herring, sardines, anchovies (tuna: less omega-3, more mercury!)



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Nuts, seeds and whole grains

- Rich in unsaturated fats, protein, fibre, minerals, **vitamin E** and polyphenols: choose unsalted nuts.
- Vitamin E from food is associated with lower Alzheimer risk; vitamin E capsules have not prevented dementia.
- Top vitamin E sources: sunflower seeds, almonds, hazelnuts
- Whole grains: oats, barley, bulgur, whole grain bread
- A handful (~30 g) a day fits Mediterranean/MIND diets.



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Berries

- Rich in flavonoids (anthocyanins, catechins, quercetin): antioxidant and anti-inflammatory
- Higher intake of blueberries and strawberries delays cognitive ageing by up to **2.5 years.**
- Fresh or frozen: blueberries, strawberries, blackberries, blackcurrants



Nurses' Health Study, 16,010 women ≥70 y (Devore, Ann Neurol 2012); observational

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Olive oil and avocado

- Rich in mono-unsaturated fats: lower LDL cholesterol and blood pressure, protecting the brain's blood vessels
- Mediterranean diet + extra-virgin olive oil or nuts improved cognition vs. a low-fat control diet.



PREDIMED-Navarra randomised trial (Valls-Pedret, JAMA Intern Med 2015)

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Leafy greens and cabbages

- Rich in fibre, folate, vitamin K, lutein, vitamin C and glucosinolates
- 1 portion of leafy greens a day: cognitive decline as if **~11 years younger**
- Belgian classics count: Brussels sprouts, kale, cabbage, cauliflower, spinach.



Rush Memory and Aging Project, 960 older adults Neurology 2018); observational

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Eggs

- Rich in choline (→ acetylcholine, memory), vitamin B12, lutein and high-quality protein
- B12 and folate keep homocysteine low; B-vitamins slowed brain atrophy in people with memory complaints and high homocysteine.
- Dietary cholesterol matters less than once thought: up to ~1 egg a day fits a healthy diet.

VITACOG randomised trial (Smith, PLoS One 2010)

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Chocolate

- Cocoa is rich in flavanols: they improve blood-vessel function and blood flow.
- Small trials: high-flavanol cocoa improved memory-related brain function.
- Large trial (COSMOS, >2,000 older adults): cocoa-flavanol supplements did **not** improve cognition overall; possible benefit with a poor diet.

- Enjoy dark chocolate (≥70%) in moderation: it also brings sugar and calories.

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Coffee

- Caffeine blocks adenosine → more alertness, attention and processing speed.
- Coffee also contains polyphenols.

- Moderate intake (≈3–4 cups/day) is associated with lower risk of Parkinson's disease, stroke and possibly dementia.
- But: no coffee late in the day; sleep is essential for the brain's overnight clean-up.



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Vitamins and supplements

- A varied diet covers most needs; supplements help mainly when there is a **deficiency.**
- High-dose single antioxidants (vitamins A, C, E): no proven dementia prevention

- Daily multivitamin: modest cognitive benefit in older adults in one large trial (COSMOS)
- Many "brain booster" products are marketed without evidence: healthy **food comes first.**

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No superfood: the pattern counts

- **Mediterranean diet**: vegetables, leafy greens, berries, nuts, olive oil, whole grains, legumes, fish; little red meat, sugar or fried food
- Cohort studies: slower cognitive decline and lower dementia risk
- **MIND** diet trial (3 years): cognition improved, but not more than with a calorie-restricted control diet
- Ultra-processed food >20% of calories: **28%** faster cognitive decline

- Lifestyle **combined** (diet + exercise + mental and social activity + blood-pressure checks) improved cognition over 2 years

Barnes, NEJM 2023; US POINTER, JAMA 2025 (n=2,111); ELSA-Brasil, JAMA Neurol 2023

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Take-home messages

1. The brain eats with us: food shapes brain health across the whole lifespan.
2. Patterns, not superfoods: vegetables, berries, nuts, olive oil, whole grains, legumes and fish
3. Less ultra-processed food, sugar, processed meat and alcohol; drink enough water.
4. Food works best together with movement, sleep, social contact and blood-pressure control.
5. Better evidence needs research: for 100 years (1926–2026) the Queen Elisabeth Medical Foundation has made Belgian brain research possible and will continue to so!

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