

Swiss Medical Students Convention (SMSC)

Fribourg - 18 octobre 2025 : 15h–16h, 16h-17h



fribourg^{smc}
2025
Lifespan revolution
Push the limits of time

Impact of nutrition/micronutrients on cognitive abilities and health

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Unil.

Berger Mette M – Disclosures - COI

Advisory Board/Consultant Baxter, DSM, Fresenius Kabi, Nestlé

Lecturer honoraria Abbott, Aguetant, Baxter, Fresenius Kabi, Nestlé

Stock shareholder, Bonds none

Member of guideline groups ESPEN ICU nutrition
ESICM ICU nutrition
ESPEN Micronutrients (chair SIG-MN)

Editor-in-chief of Curr Opin Clin Nutr Metab

Question:



Is malnutrition in the general population an issue in Switzerland ?

Is micronutrient deficiency an issue in CH?

Are children (0-16 years) at higher risk?





WHO definition of malnutrition

Malnutrition refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients or impaired nutrient utilization.

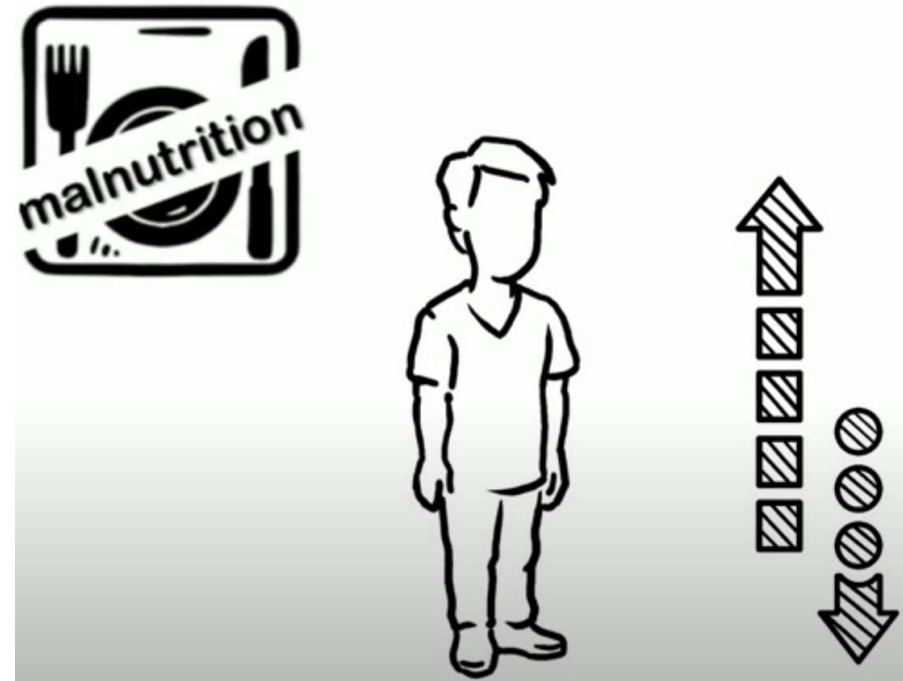
The double burden consists of both **undernutrition** and **overweight and obesity**, as well as diet-related noncommunicable diseases

Undernutrition manifests in 4 broad forms:

- **wasting,**
- **stunting,**
- **underweight, and**
- **micronutrient deficiencies**

https://www.who.int/health-topics/malnutrition#tab=tab_1

<https://www.youtube.com/watch?v=Rk7SFkGuOvw>



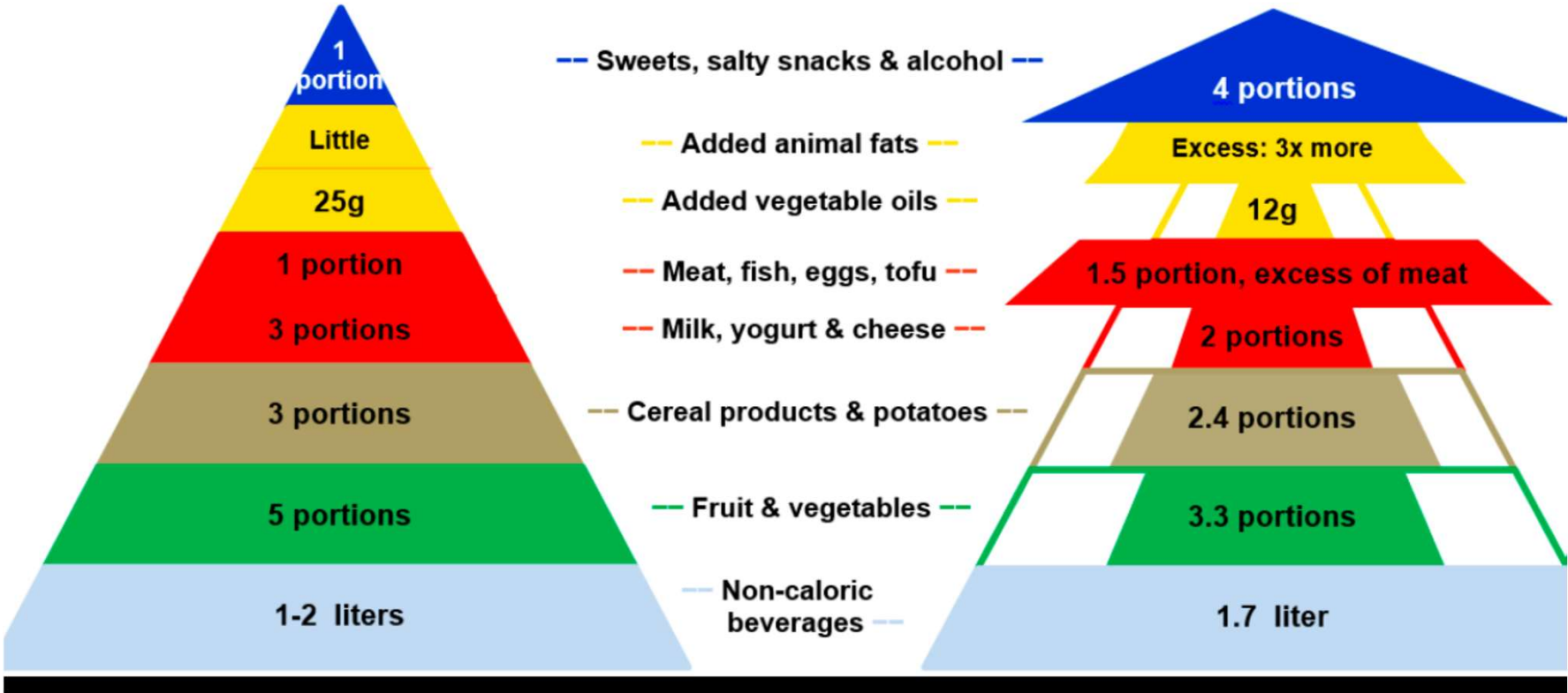
Essential Micronutrients

<u>TRACE ELEMENTS</u> (11)			<u>VITAMINS</u> (13)			
→	Cu	★ Copper	→	A	★ Retinol	Antioxidant Functions direct or indirect
→	Se	★ Selenium	→	D	★ Cholecalciferol*	
→	Zn	★ Zinc	→	E	★ Alpha-tocopherol	
	Fe	★ Iron		K	Phylloquinone	
→	Mn	Manganese		B1	Thiamine	Immune functions
	Mo	Molybdenum	→	B2	★ Riboflavin	
	Cr	Chromium	→	B3	Niacin (PP)*	
	F	Fluoride		B5	Pantothenic acid	
	I	Iodine		B6	★ Pyridoxine	
	Co	Cobalt		B7	Biotin	
	V	Vanadium	→	B9	★ Folic acid	
				B12	★ Cobalamin	
			→	C	★ Ascorbic acid	
			→	Q10	Coenzyme	
+	Ni, Si, Sn					

* Synthesized in the body

Major Differences in Diet across Three Linguistic Regions of Switzerland: Results from the First National Nutrition Survey menuCH

Chatelan ... Bochud (IUMSP), Nutrients 2017;9:1163

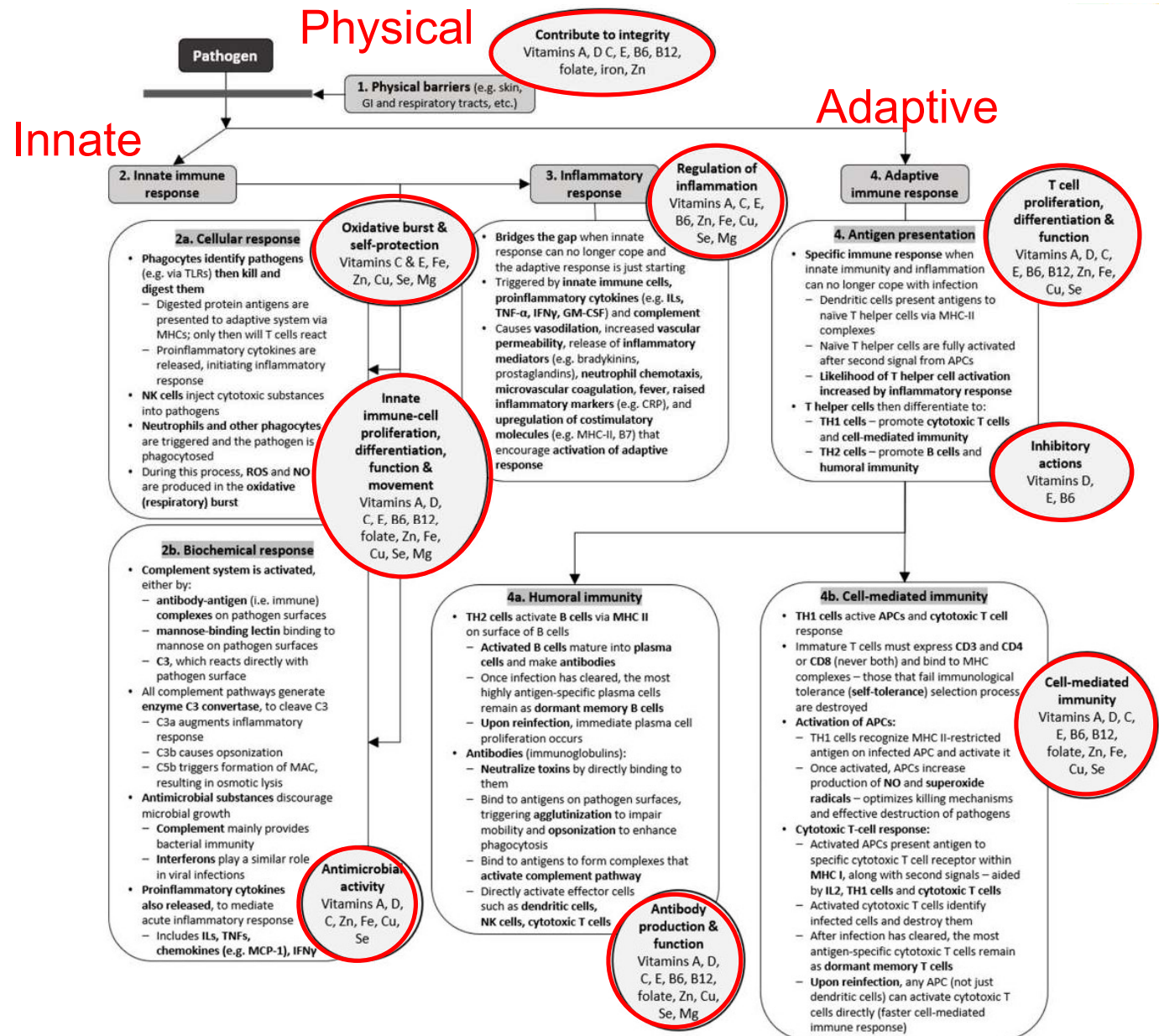


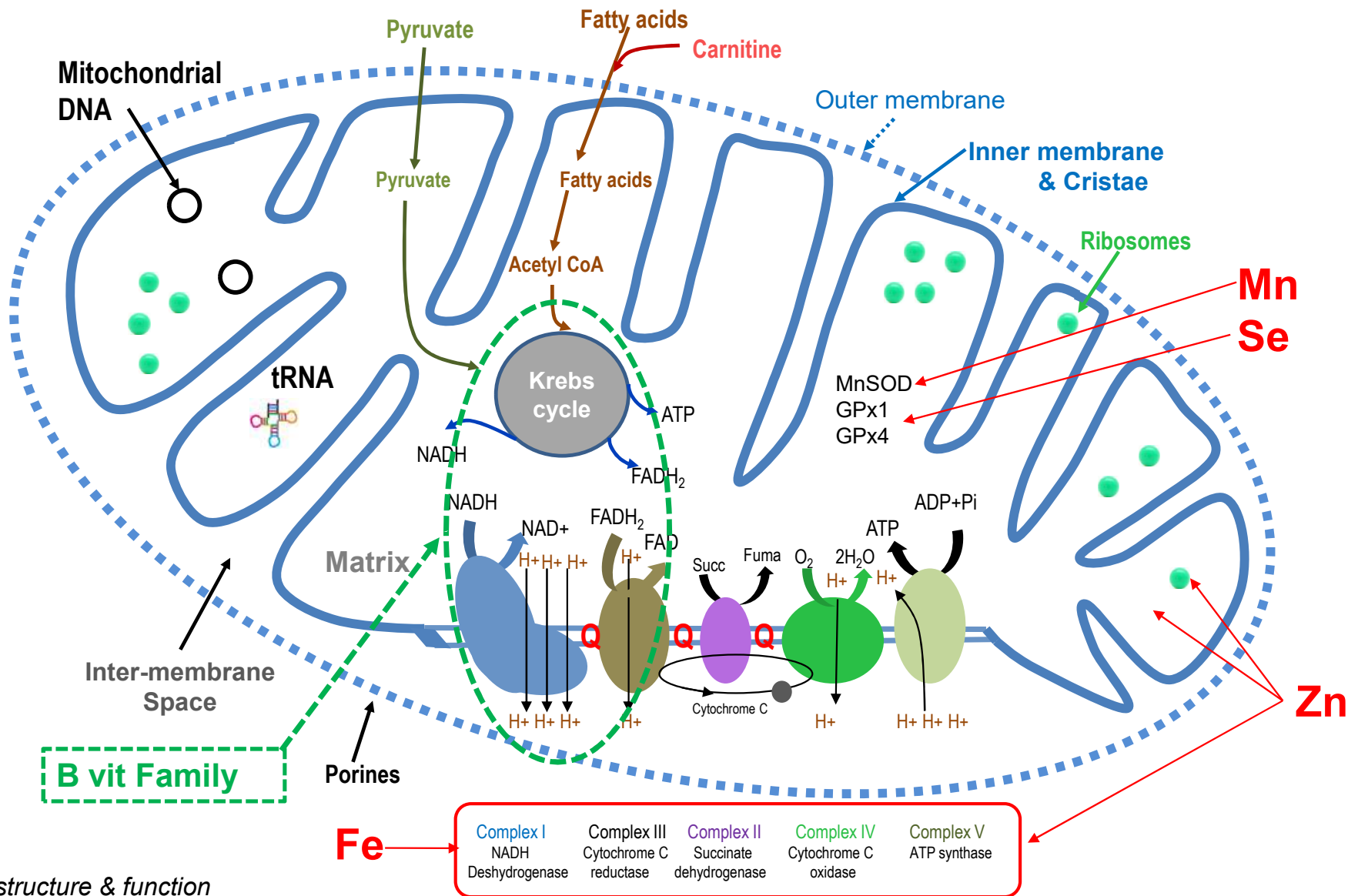
The daily food based dietary guidelines compared to the actual food consumption

Micronutrients and the Immune System—Working in Harmony

Gombart AF et al,

Nutrients 2020, 12:236





Mitochondrial structure & function
Berger COCNM, 2020;23:102

Figure 3 : apports en certaines vitamines **par groupe d'âge et par genre**, comparés aux valeurs de référence D-A-CH (pour la vitamine D, la recommandation de l'OSAV a été utilisée comme référence).

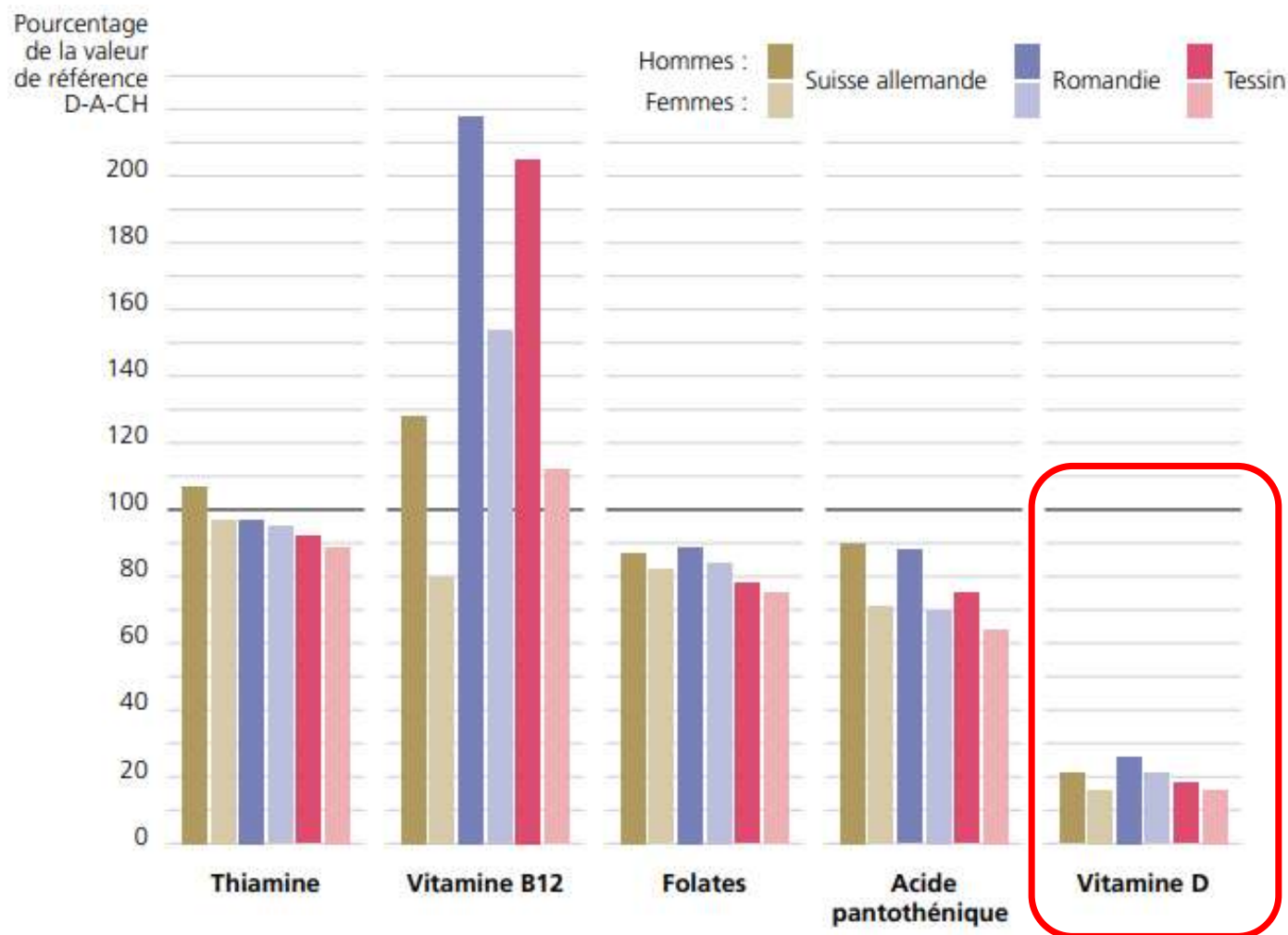
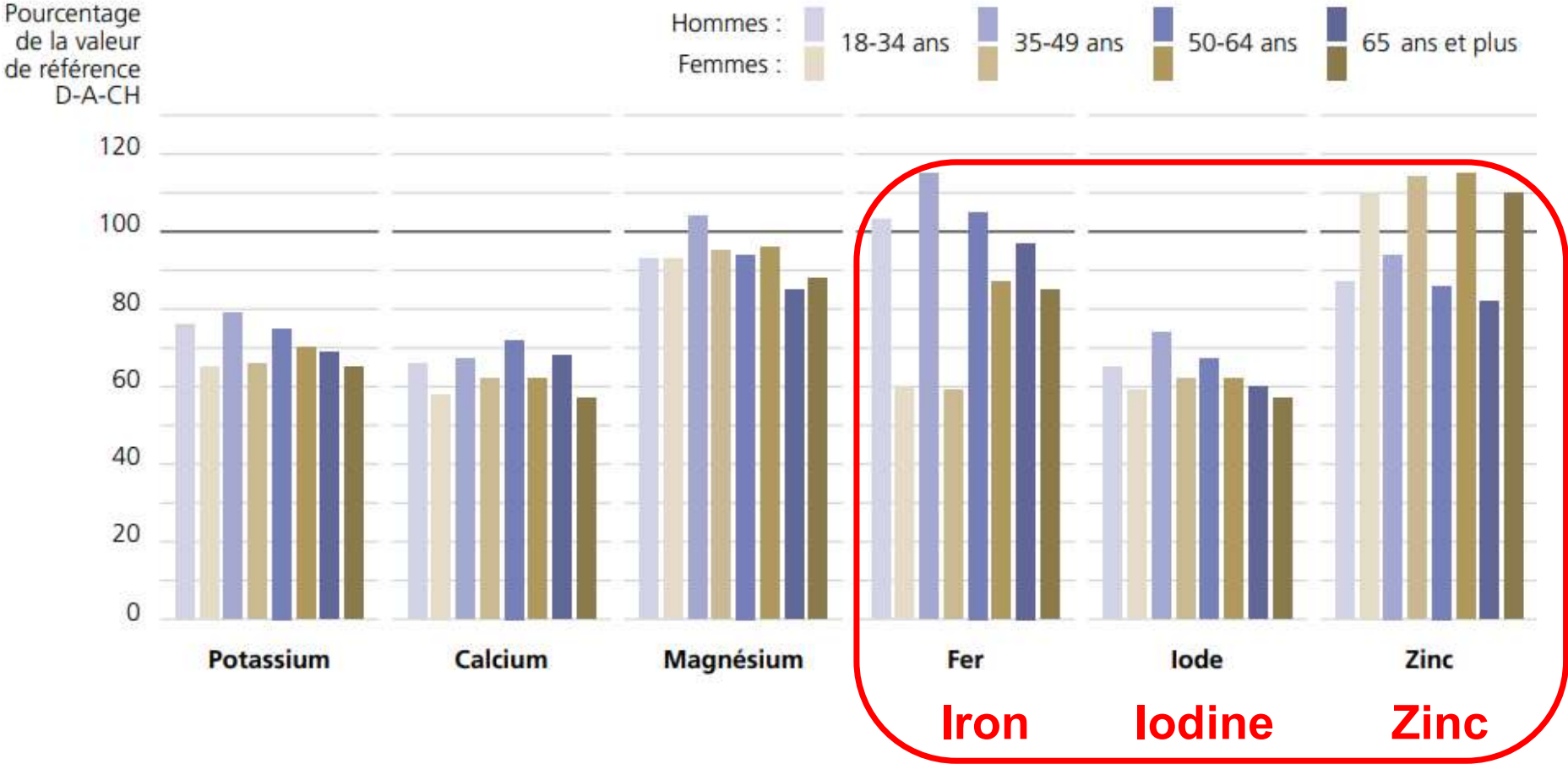


Figure 2 : apports en certains minéraux **par groupe d'âge et par genre**, comparés aux valeurs de référence D-A-CH (pour l'iode, la recommandation de l'OSAV est la référence).

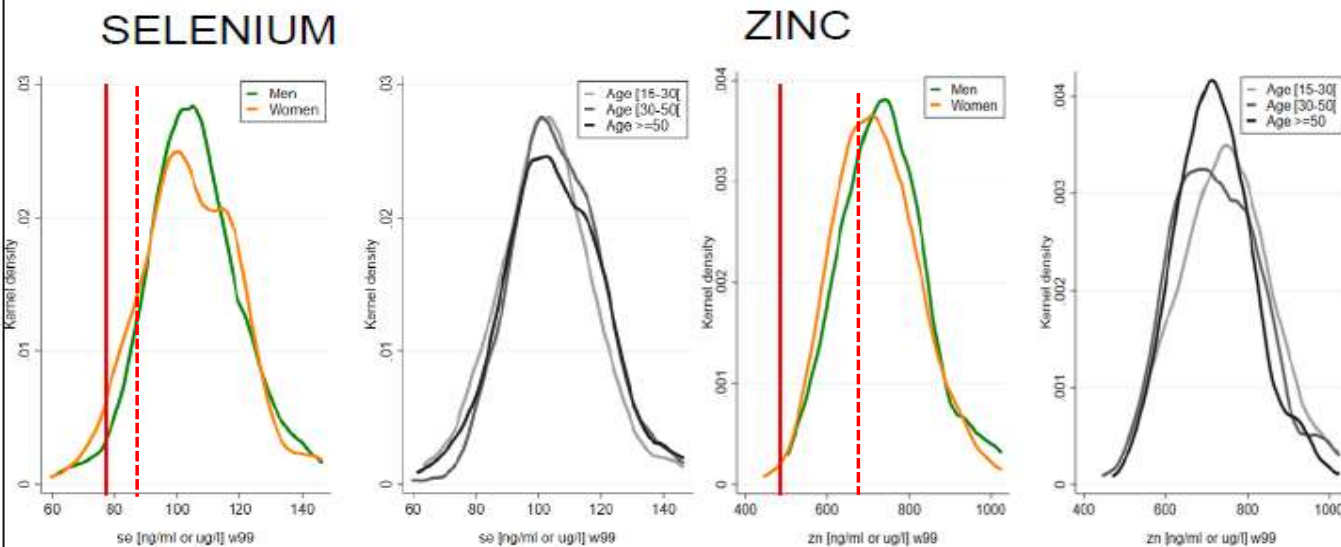
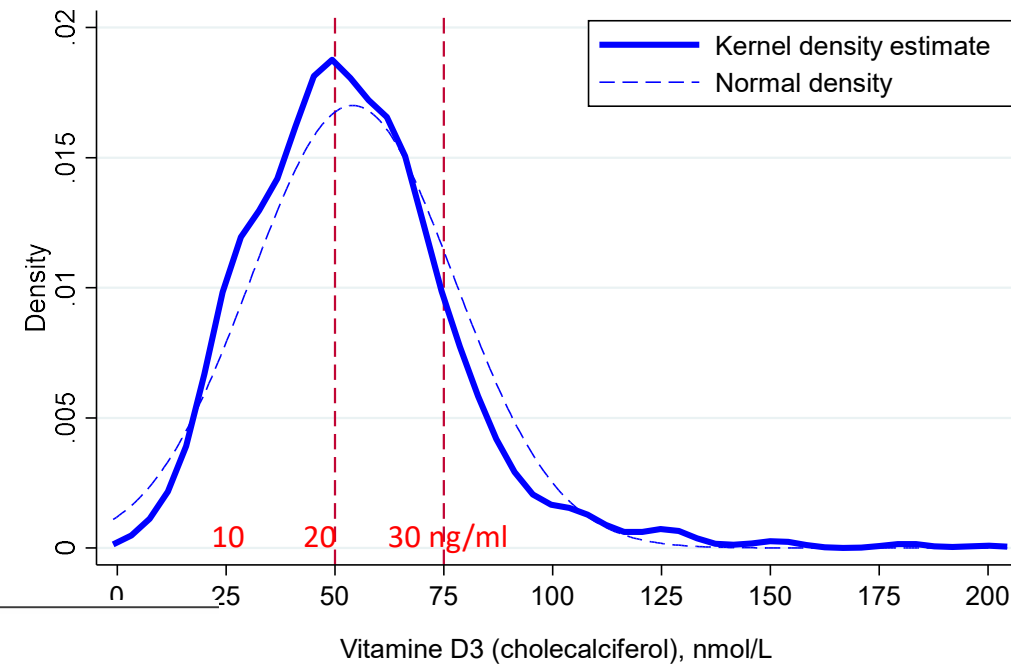


NutriCOVID – sub-study of SeroCOVID – Lausanne

Samples May 2020 –1st COVID wave

991 (1043) subjects

- 206 COVID PCR proven cases «index»
- 294 close contacts
- 490 general population



ssian, bandwidth = 4.6979

Bochud M et al - 2021
Preliminary unpublished data

Malnutrition in Swiss children?



WHO: Causes of malnutrition: primarily poverty, often very inadequate education, and an unbalanced, incomplete, or monotonous diet, followed by diseases affecting the ability to ingest and absorb nutrients.

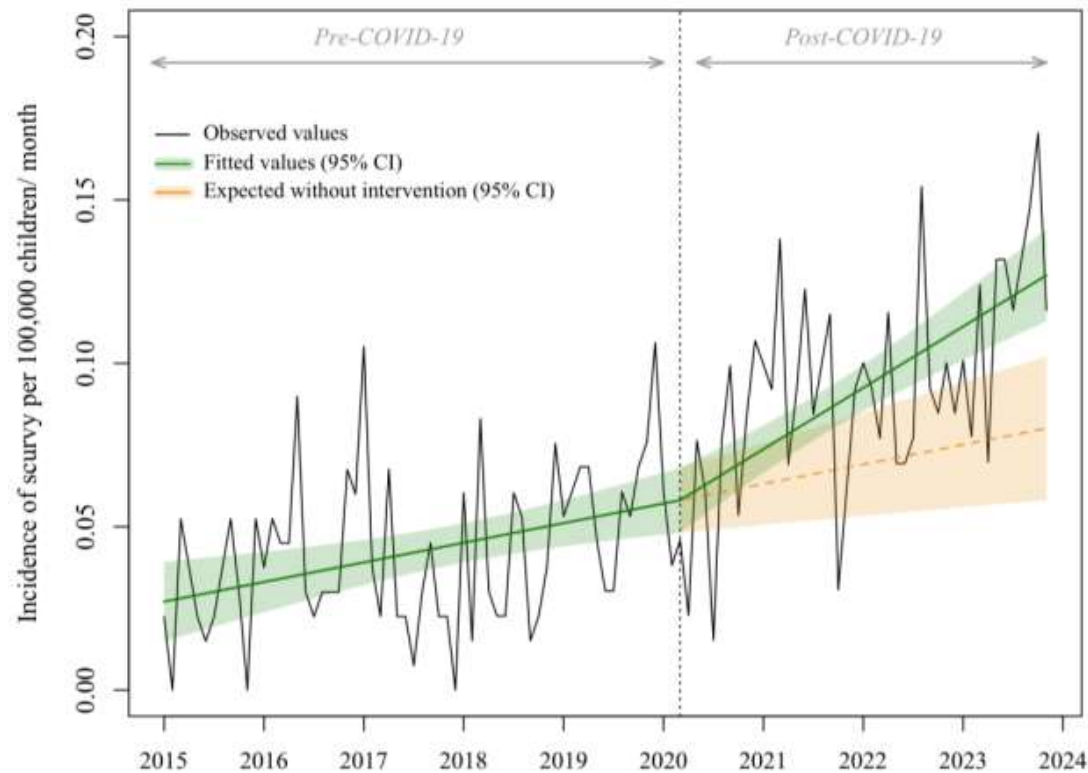
On 31 March 2025, Caritas published a call for urgent action.

- In Switzerland, 1.4 million people are affected by or at risk of poverty (9): 16.1% of the Swiss population has no financial leeway to cope with rising costs, particularly rents and health insurance: 8.1% of the Swiss population was living below the official poverty line in 2023.
- This represents 708,000 people, according to the Federal Statistical Office (FSO). Many households are unable to make ends meet despite their income from work. **Children and family members** who are not in employment and live under the same roof are also affected.
- 'These people's wages are being absorbed by the rising cost of living. Their financial leeway is becoming increasingly limited.'

Scurvy incidence trend among children hospitalised in France, 2015–2023 : A Nine-Year Time-Series Analysis

Assad Z et al, Lancet Reg Health Eur 2025; 49:101159

Assistance Publique-Hôpitaux de Paris, Paris



B) Consumer price index for food products

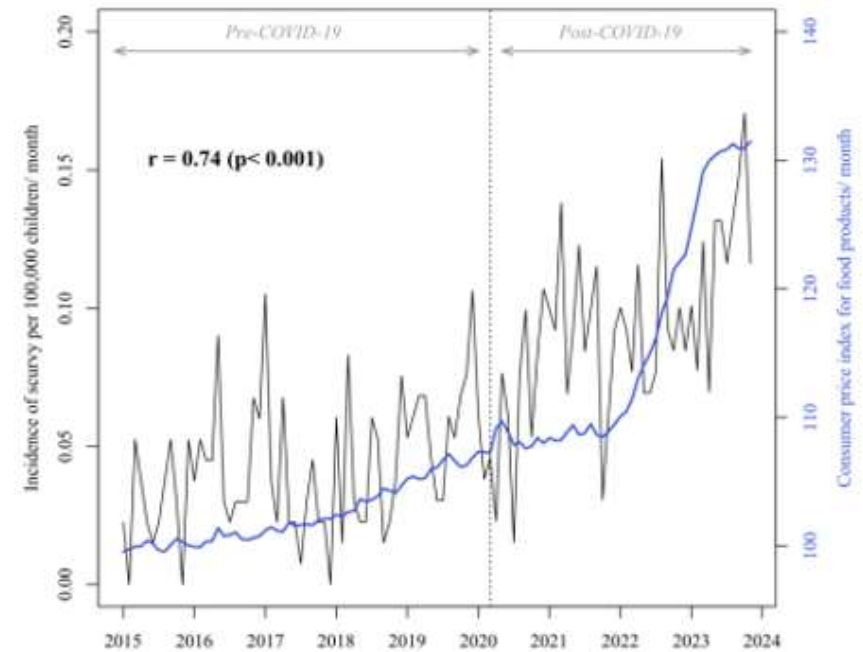


Figure 1. Association of the COVID-19 pandemic with the monthly incidence of Scurvy 487 per 100,000 children younger than 18 years (N=888)

MICRONUTRIENTS AT RISK OF DEFICIENCY IN CH

Iodine

Iron

Zinc

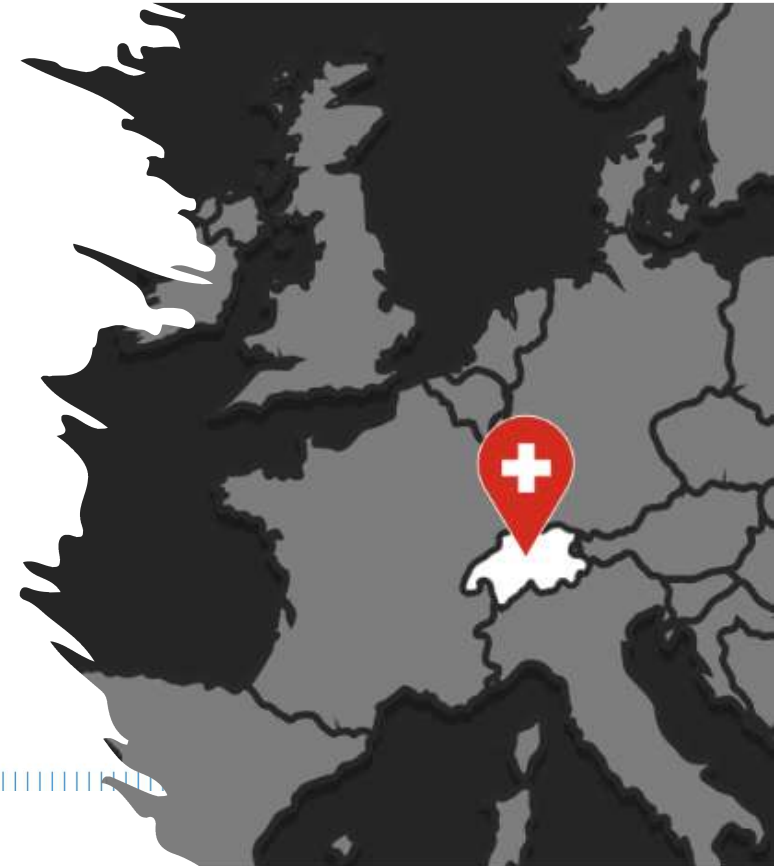
Selenium

Vitamin D

B9 - Folic acid

B12 - Cobalamin

Omega-3 PUFA





Étude NutriNet-Santé
PI: Mathilde Touvier

Nutri-score is a 5-level nutritional labelling system, ranging from A to E and from green to red, placed on the front of food packaging, based on the nutritional value of a food product.

Objective: to help consumers recognise the overall nutritional quality of foods and compare them with each other, to encourage the choice of healthier products **and thus contribute to the fight against chronic diseases** such as cardiovascular disease, certain cancers, obesity and diabetes.

NUTRI-SCORE

- Proposed in 2014 by Prof. Serge Hercberg & team (Sorbonne-Paris-Nord University) based on epidemiological data
- 2016: Implemented by Santé publique France in as part of the law on the modernisation of the health system
- Subsequently adopted in other countries: Belgium, Spain, Germany, Luxembourg, the Netherlands and Switzerland.
- Use is recommended by the International Agency for Research on Cancer [3] and the World Health Organisation (WHO), and supported by the Working Group on the Promotion of Nutri-score of the World Federation of Public Health Associations (WFPHA), prepared with the French Society of Public Health.
- 2020: the European Commission considered introducing a mandatory nutrition logo
- 2024, Nutri-Score algorithm updated to promote healthier food choices.
- 2025, European Union reportedly abandoned plans to roll out Nutri-score across the board.
- Nutri-score is the target of intense lobbying by the agri-food industry to delay or prevent its adoption, or to have it withdrawn.

En juin 2025, Nestlé Suisse annonce à son tour le retrait progressif du Nutri-score sur ses marques locales vendues exclusivement en Suisse, telles que Cailler, Thomy ou Henniez



Factors that negatively affect the score

Energy (kcal) content per 100 grams.

Sugar content.

Saturated fat content.

Salt content.

Factors that positively affect the score

Fruit, vegetable, legume content (incl. pulses), oilseeds, rapeseed oil, nut oil and olive oil content.

Fibre content.

Protein content.

Not integrated in calculation of fruit and vegetable content: starchy foods (such as potatoes, sweet potatoes, taro and cassava, including tapioca) are not taken into account.

For cheese, the protein content is always taken into account as it is linked to the calcium content.



New Nutri-Score – update 2024

It is applied in six European countries, but pressure from manufacturers has delayed its rollout in France. (→ March 2025)

Some dairy manufacturers opposed it because it changes the category of milk.

Milk is no longer considered a food but a beverage.

However, among these beverages, water is given the letter A, skimmed and semi-skimmed milk are rated B instead of A, and whole milk is given a C, compared to B previously.

Sweetened beverages are also penalized.

On the other hand, olive oil (rated B), rapeseed oil, and oily fish are favored, as are products rich in protein and fiber.



Carte d'Europe montrant les positions par État : ■ Gouvernement favorable ■ Industriels volontaires favorables ■ Gouvernement défavorable

Impact of Front-of-package nutrition labelling, FOPL

« Impact of color-coded and warning nutrition labelling schemes : A systematic review and network meta-analysis », Song *et al*, [PLOS Medicine DOI 10.1371/journal.pmed.1003765](https://doi.org/10.1371/journal.pmed.1003765)

2021, méta-analyse investigating impact of nutritional labeling on packaging on consumer choice, found that Nutri-score reduced the likelihood of selecting less healthy products.

It also noted the following associations for the products purchased:

- -7.9% increase in overall food quality;
- - 6% reduction in energy;
- - 7.8% reduction in salt/sodium;
- - 15.7% reduction in fat;
- - 17.1% reduction in saturated fat;

Authors conclude that “color-coded labels are more effective in guiding purchases toward healthier products, while warning labels have the advantage of discouraging the purchase of unhealthy products.”

Feeding your brain

Especially during exam. periods



<https://thejemfoundation.com/how-nutrition-affects-mental-health/>

Suicide study: <https://bmcmmedicine.biomedcentral.com/articles/10.1186/s12916-017-0791-y>

Tools to boost your brain during exams?

Question:
what is your preferred food during the exam period?

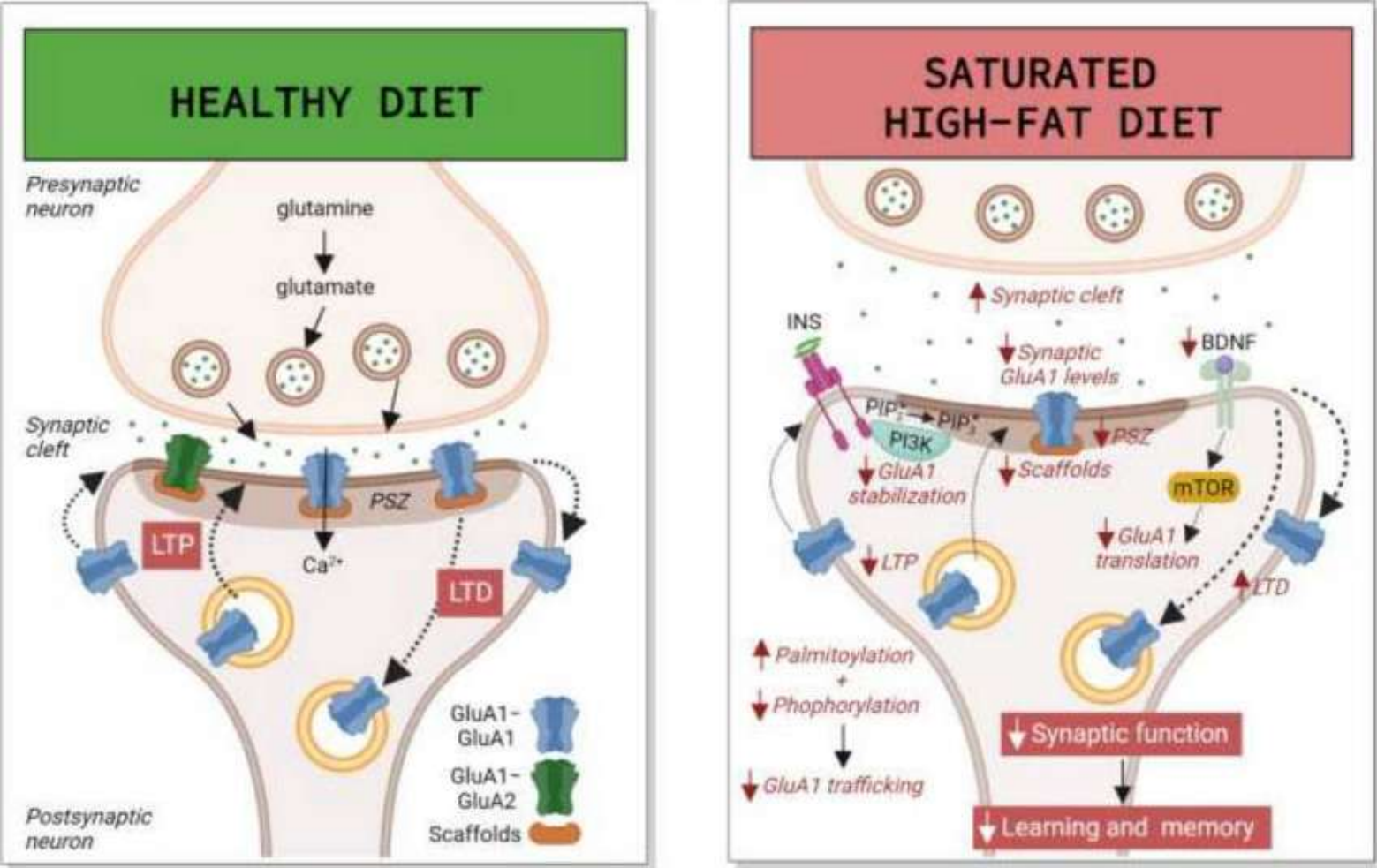
- I do not cook ?
- only fast food ?

Unil.



Feeding the Brain: Effect of Nutrients on Cognition, Synaptic Function, and AMPA Receptors

Fado R et al, *Nutrients*. 2022 Oct 5;14(19):4137. doi: 10.3390/nu14194137



High-fat/high-sugar diets, even over short exposure times, are associated with reduced arborization, widened synaptic cleft, narrowed post-synaptic zone, and decreased activity-dependent synaptic plasticity in the hippocampus. These alterations correlate with deregulation of the AMPA-type glutamate ionotropic receptors (AMPA-Rs) that are crucial to neuroplasticity.

AMPA = α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid

Fig.: Mixed and saturated high-fat diet (HFD) deregulation of AMPARs in the hippocampus

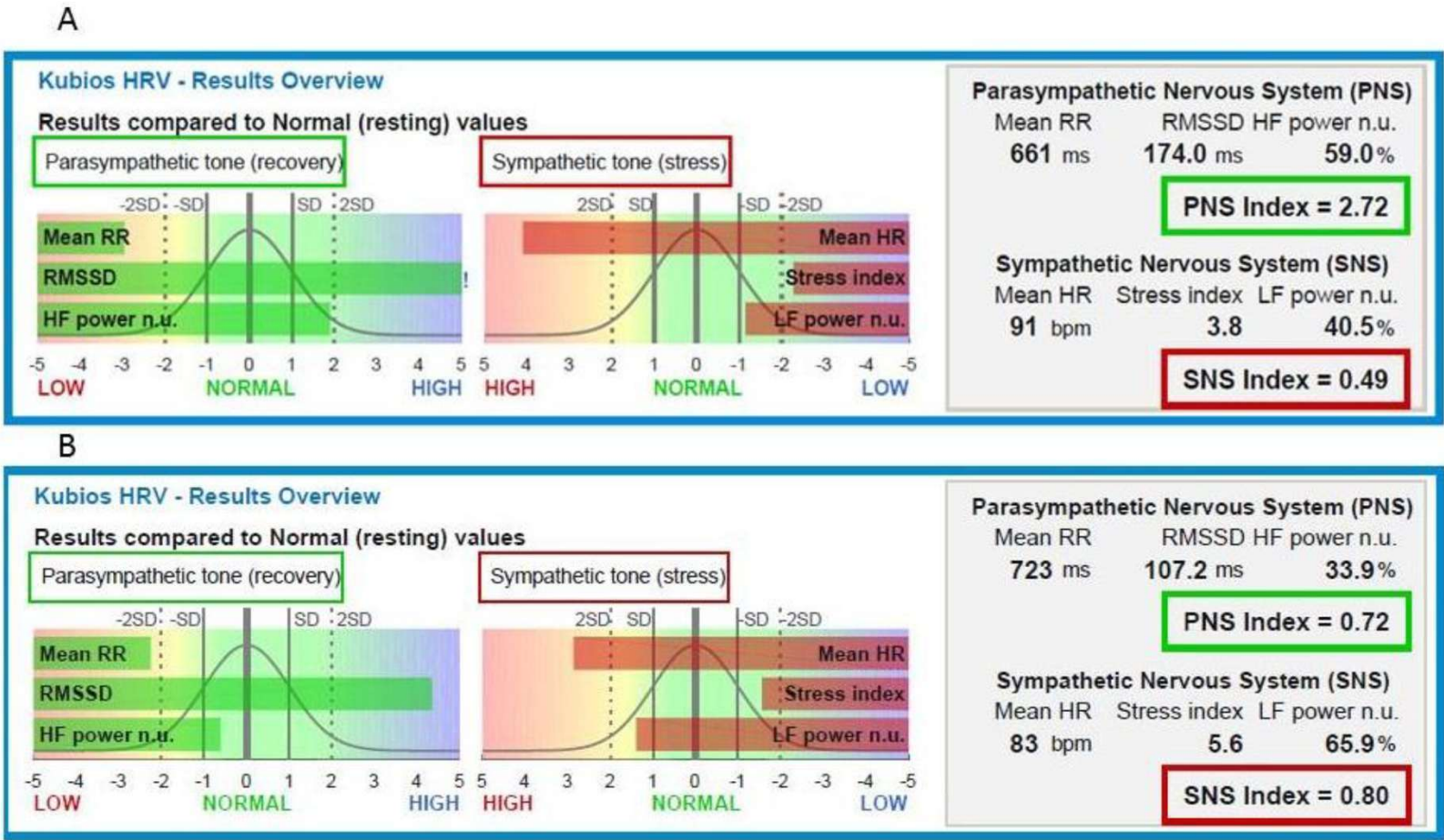
Analysis of Stress Levels in University Students During Examination Periods

dos Santo AD et al, Brazilian J Clin Med Rev. 2025:Jan-Dec;03(1):bjcm r3.

Lipp Adult Stress Symptoms Inventory

Observation in 16 students:

- **45%** reported experiencing **muscle tension, tachycardia, and sudden enthusiasm** in the last 24 hours before the evaluation. These symptoms are characteristic of **↑ sympathetic activity**.
- **20%** reported memory problems, forgetfulness, a sense of exhaustion, and constant thoughts over the last month.
- **10%** expressed a desire to escape everything and excessive fatigue over the last 3 months,
- **25%** reported no symptoms.



index and percentage values for sympathetic and parasympathetic systems. A) before the exam B) after the exam.
Abbreviations: parasympathetic nervous system (PNS) index (RR interval), sympathetic nervous system (SNS) index

Association between academic stress during exam period, dietary behavior and bowel symptoms among medical students in Saudi Arabia

Alduraywish S et al Clin Epidemiol Global Health 2023;22:101318..

Methods: 297 medical students participated in the study. Medical students from all five years of study were recruited using a stratified random sampling technique. A structured questionnaire containing three sections on stress levels, eating habits, and bowel symptoms was self-administered. Student t-test and ANOVA were used to quantify the association between variables

Results: The medical students showed high levels of stress accounting for low (2%), moderate (72%), and high-stress levels (26%) during exams. Men showed higher stress levels than women. The levels of stress were similar in distribution across all years of study. Poor dietary habits were noted among the medical students. Around 66% reported skipping breakfast, and 69% consumed frequent unhealthy snacks. Reduced consumption of fruits less than three times per week (61.5%) and drinking water less than 2 L per day (82.3%) was noted. Mean dietary scores worsened as the stress levels increased ($p = 0.007$). Similarly, higher PAC-SYM (Patient Assessment of Constipation-Symptoms) scores were associated with higher stress levels ($p < 0.001$). Women showed more severe constipation symptoms than men (8.83 ± 8.02 ; 5.68 ± 5.87 ; $p < 0.001$)

The stress-related adverse changes in the diet behavior of medical students is another important finding of the study. Deliberate skipping of breakfast reported by 66% of students is appalling. Moreover, consumption of an unhealthy diet was predominant in the form of frequent snacking of fried food and, lesser consumption of fruits and water.

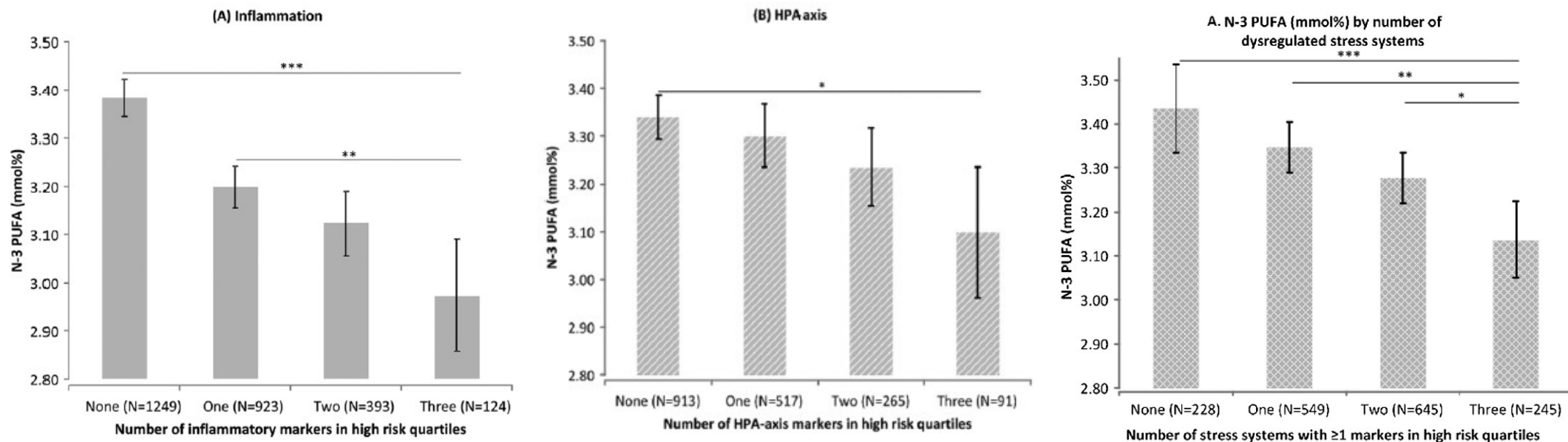
Furthermore, only 39.5% consumed three meals a day and 58% reported further deterioration of eating behavior during exams. An inverse relation was evident between increasing levels of stress and poor eating habits score ($p = 0.007$).

Omega-3 polyunsaturated fatty acid levels and dysregulations in biological stress systems.

Thesing TA et al, Psychoneuroendocrino 2016;97:206

Method: **Plasma n-3 PUFA** and **DHA** in 2724 participants from the Netherlands Study of Depression and Anxiety. Linear regression analyses (adjusted for sociodemographic, sampling, lifestyle and somatic disease variables) associated **inflammation** (C-reactive protein, IL-6, TNF-alpha), **HPA-axis** (cortisol awakening response and evening cortisol) and **Autonomic nervous system markers** (heart rate, respiratory sinus arrhythmia and pre-ejection period). Mean age of 41.8 ± 13.1 y.

Conclusions: study confirmed that having various (cumulative) indicators of dysregulation of 3 biological stress systems was significantly associated with lower n-3 PUFA and DHA plasma levels. Opens door for n-3 PUFA supplementation to reduce biological stress and thereby improve somatic and mental health.



Common “standard-rapid” food during exams

Tab. 2 Menu type de nombreux étudiants en médecine pendant les phases d'examens (durée env. 2 mois)	
Boissons *	Maté, café, Redbull®, Coca-Cola® et similaires
Base	Pâtes, Nouilles «instantanées»
Douceurs	Barres chocolatées
* nombreux sont ceux qui ignorent que ces boissons contiennent de la caféine.	

Tab. 2 Typisches Menü vieler Medizinstudenten während der Prüfungsphasen (Dauer ca. 2 Monate)	
Getränke *	Mate, Kaffee, Redbull®, Coca-Cola® und ähnliche Getränke
Basis	Teigwaren, Instant-Nudeln
Süßigkeiten	Schokoriegel
* Viele Menschen wissen nicht, dass diese Getränke Koffein enthalten.	

During stressful periods (exams, assignments), sport, social relationships and nutrition take a back seat.

Under the pretext of minimising external mental stress, many students consider planning or preparing balanced meals to be a distraction.

Minimalist solutions are favoured (Table 2).

The seriousness of the situation is minimised: ‘It's no big deal, I'll eat when I go home to my parents' house.’

Carbotoxicity -Impact of High carb food

- The intake of free sugars per person/year amounts to 49 kg in the United States and 35 kg in Europe, which multiply cardiovascular mortality by a factor of 2–3 versus people who consume <9.1 kg sugar per year (WHO).
- simple carbohydrates and refined carbohydrates impact:
 - impact mood: alertness and tiredness, reinforcing a vicious circle.
 - Impact physical health: risk of developing metabolic syndrome and subsequently developing metabolic disease
- Chronic intake → higher weight gain with visceral fat depots, type 2 diabetes, dyslipidemia, non-alcoholic fatty liver disease (NAFLD), ↑blood pressure, ↑cardiovascular mortality, and rheumatoid arthritis, and progression of age-related macular degeneration

Cell. 2018 Oct 18;175(3):605–614. doi: [10.1016/j.cell.2018.07.044](https://doi.org/10.1016/j.cell.2018.07.044)

Nutrients. 2022 Sep 15;14(18):3809. doi: 10.3390/nu14183809

Immediate (same day) or nearly immediate (7-10 days) effects of unbalanced food.

- Blood glucose ↑ → insulin ↑
- Stress ↑: higher catecholamine + cortisol levels
worsens already present stress
- Reduction of body micronutrient reserves
B vitamin family rapidly depleted
zinc
iron
omega-3 PUFA

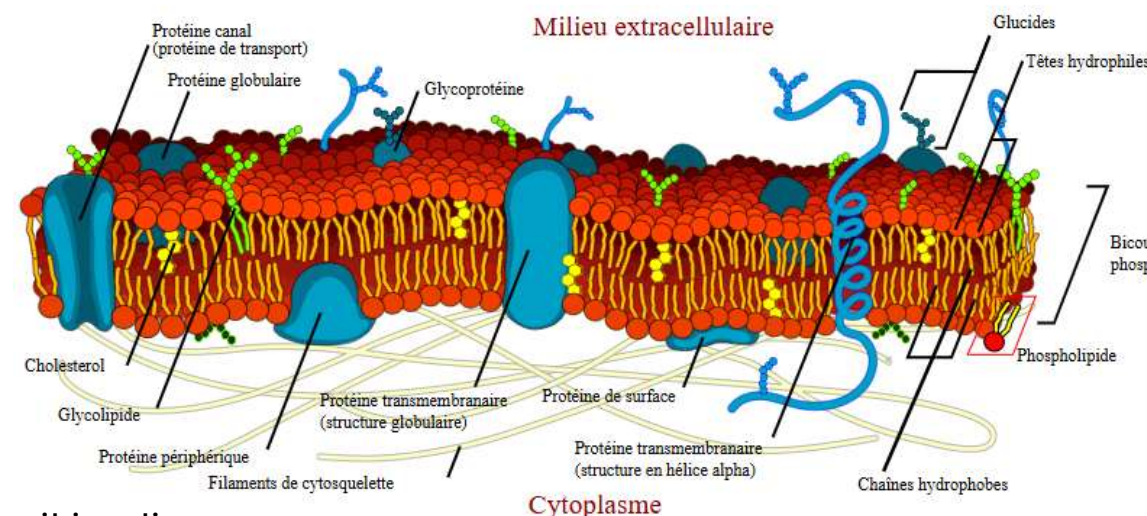
EPA+DHA - Omega-3 PUFA



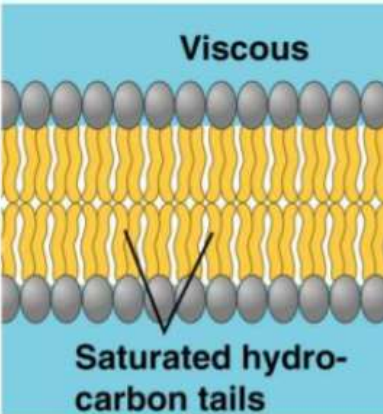
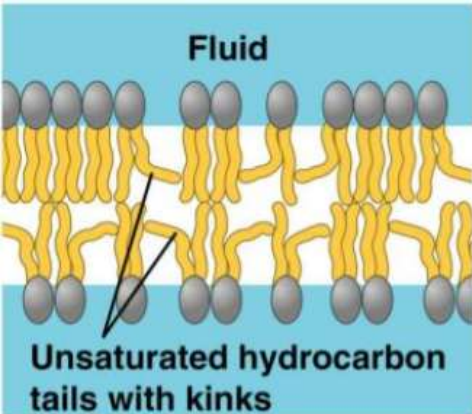
Not micronutrients, but...
They regulate important physiological functions including

- the neurological system
- blood pressure control
- haematopoiesis
- glucose metabolism
- inflammatory responses
- remarkable therapeutic potential against a variety of diseases

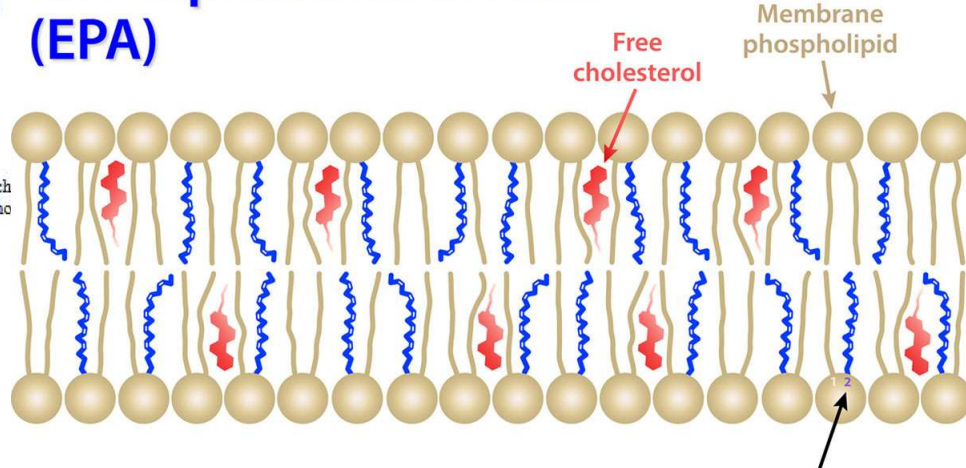
Cell membrane lipids & fluidity



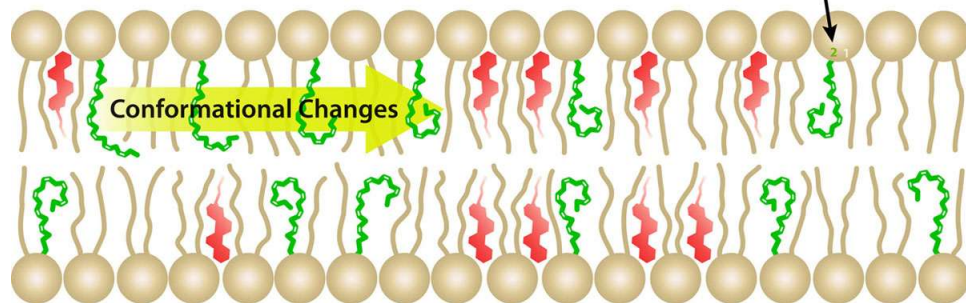
wikipedia



Eicosapentaenoic Acid (EPA)



Docosohexaenoic Acid (DHA)



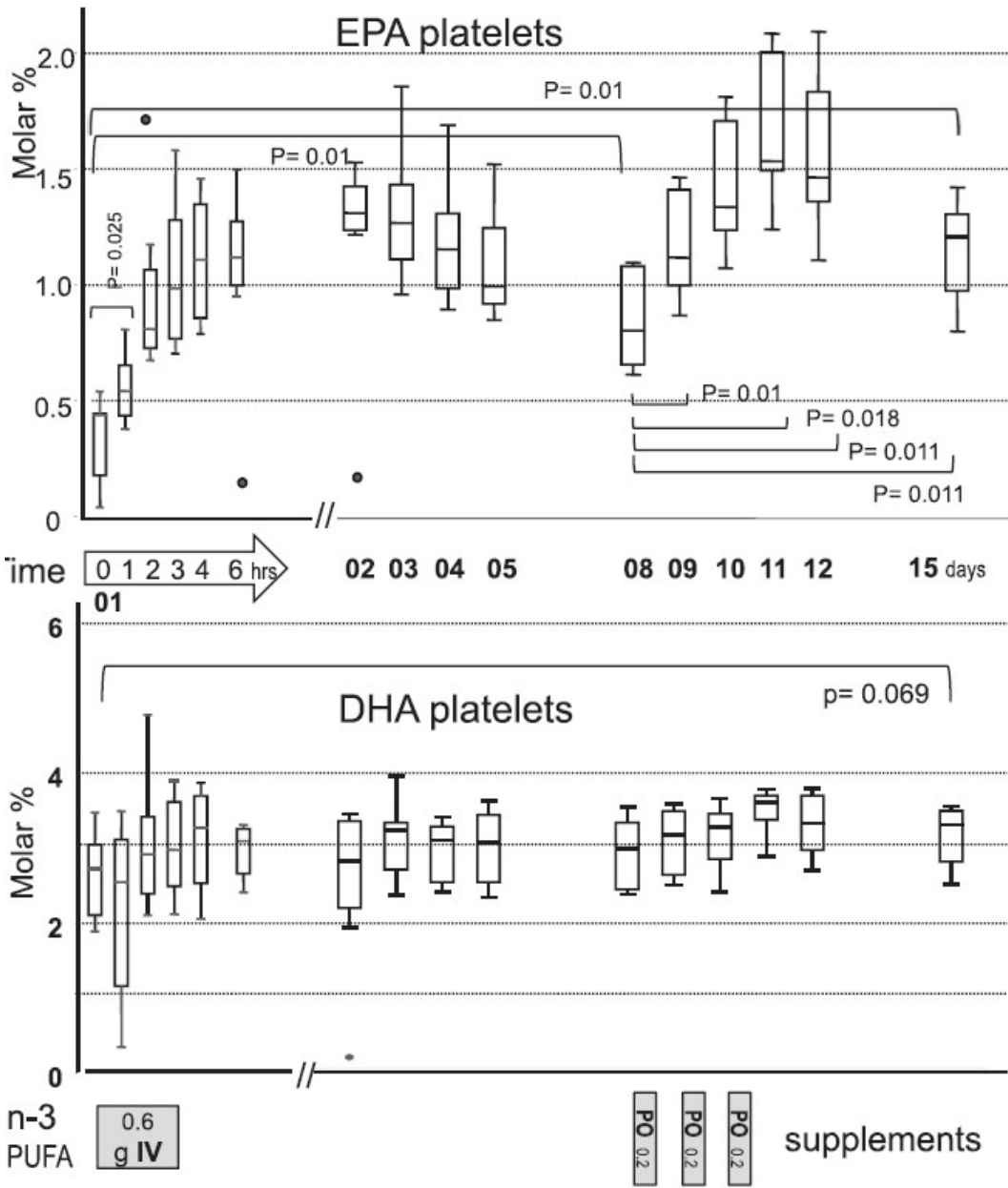
Incorporation and washout of n-3 PUFA after high dose intravenous and oral supplementation in healthy volunteers

Delodder et al. / Clinical Nutrition 2015;34:400

The lipid emulsion (10% Omegaven®, Fresenius Kabi AG, Stans, Switzerland) contained 20.1% EPA and 18.4% DHA as well as 0.02 g DL-α-tocopherol per 100 ml. A dose of 0.6 g/kg (i.e. 6 ml/kg) was infused over 3 h.

The oral supplementation was delivered over 3 consecutive daily doses of 0.2g n-3 PUFA/kg provided as capsules (Omega 3 Gisand, Bern, Switzerland) containing 1200 mg of fish oil including 453 mg n-3 PUFA (120 mg EPA, 333 mg DHA).

N cps	Total n-3 PUFA dose (g)
25	30.0
34	40.8
26	31.2
28	33.6
49	58.8
43	51.6
39	46.8
47	56.4



Which nutrients counteract stress

Of course – balanced food with fruit, vegetables, fat fish

Omega-3 PUFA: fatty fish

or supplements – 2-3 g/day before you start exam preparation:
cheapest available from Migros

Multi-micronutrients: 1/day during risk period

cheap correct ones, available from the big distributors Aldi, Lidle, Coop, Migros – do not buy on web.

Cheap high quality food sources

Eggs

Sardines, Mackerel (boxes)

Lentils (hermetic boxes)

Liver (B12, Iron)

Tofu

Milk, Cheese

Broccoli

Easy cooking recipes:

Universitäre Altersmedizin FELIX PLATTER (D & F)

<https://share.google/yQd97U6UpWH50O7UJ>



1. Auflage 2017
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ISBN 978-3-033-06499-7

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Muriel & Joel

Wir, Muriel und Joel, haben uns während des Studiums an der Uni in St. Gallen kennen und lieben gelernt. Bereits eine der ersten Verabredungen fand bei einem «Blueberry Pancakes»-Zmorge statt. Gemeinsam zu kochen und gut zu essen war für uns von Anfang an eine grosse Leidenschaft.

Muriel hat schon seit ihrer Kindheit gerne gekocht, war immer bei ihrer Mutter in der Küche anzutreffen und hat durch sie die Leidenschaft fürs Backen entwickelt. Seit sie vor zwei Jahren erfahren hat, dass eine Glutenunverträglichkeit der Grund ihrer chronischen Bauchschmerzen ist, hat sie sich besonders auf mehlfreies Backen spezialisiert. Sie hat sich zudem über längere Zeit vegetarisch ernährt, weshalb sie sich auch auf diesem Gebiet besonders gut auskennt.

Joel hat bereits in der Primarschule beim Schmelzli ein Spiegelbild über dem Feuer gebraten, weil ihm ein Cervelat zu langweilig war – richtig kochen gelernt hat er aber erst im Studium. Da mussten plötzlich mit einem kleinen Budget 3 Menüs am Tag auf den Tisch gezaubert werden. Schnell kam die Einsicht, dass Tiefkühlpizza und Spaghetti mit Pesto weder dem Gaumen grosse Freude bereiten noch das körperliche

Wohlbefinden langfristig fördern. Gemüse und Abwechslung mussten her!

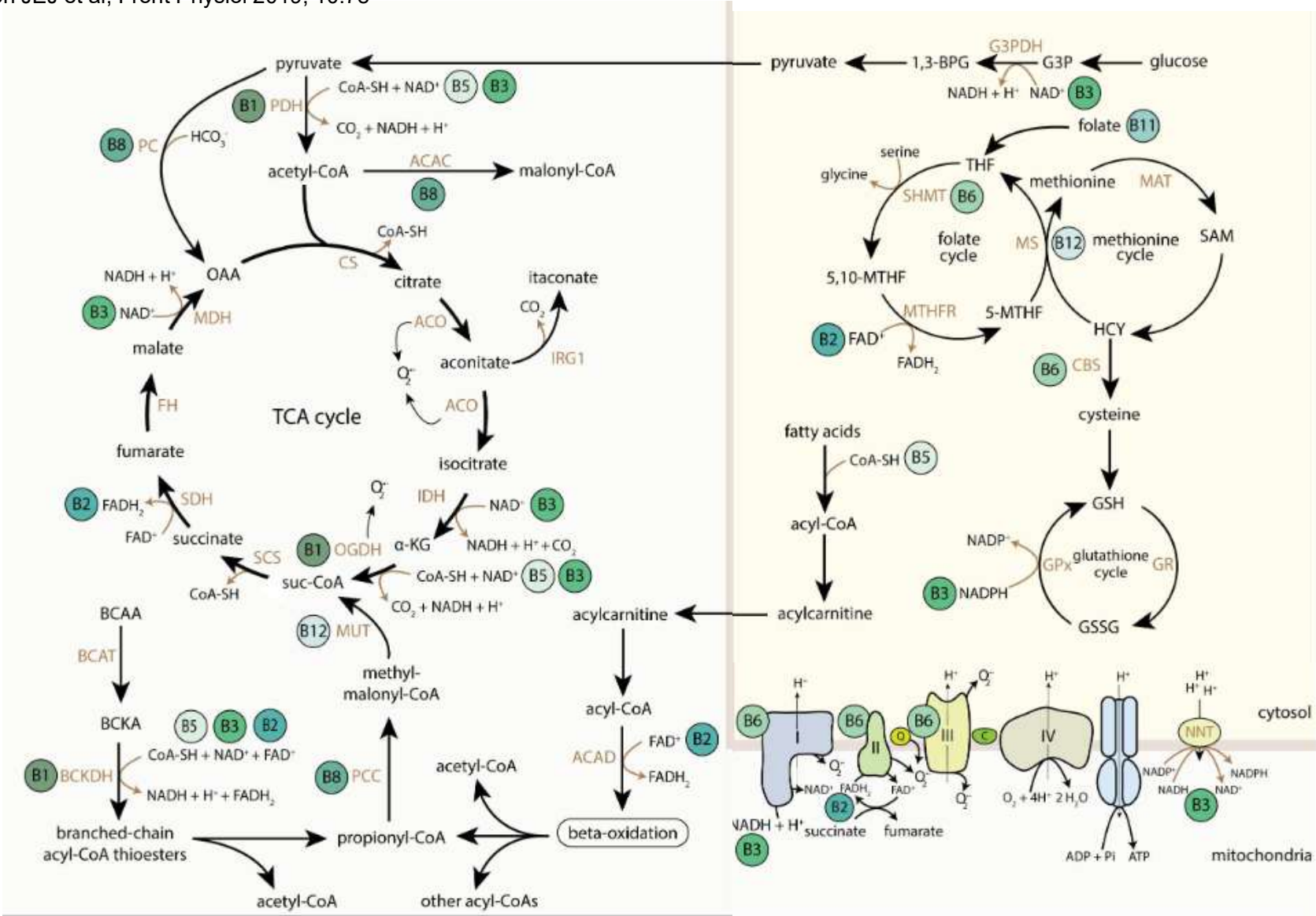
Während Joels Zivildienstsaatz in einem Jugendtreff kam die zündende Idee: In einer Diskussion mit Jugendlichen kam die Frage auf, ob es eigentlich möglich sei, für fünf Franken eine anständige Mahlzeit zu kochen. Die Meinungen waren sehr unterschiedlich. Joel war überzeugt davon, da er im Studium kein höheres Budget hatte und am Ende mit etwas Übung doch immer sehr schmackhaft und ausgewogen essen konnte. Um das scheinbar Unmögliche zu beweisen, machten sich Joel und Muriel daran, Rezepte zusammenzutragen, Preise nachzurechnen und alle Essgewohnheiten genau unter die Lupe zu nehmen. Das grosse Täufeln konnte beginnen!

Daraus entstanden ist dieses Buch. Es soll Euch als Inspiration dienen aber auch Nachschlagewerk sein für all jene, die vielleicht noch nicht oft für sich alleine kochen mussten.

Wir hoffen, dass auch Ihr genauso viel Freude beim Kochen und Ausprobieren habt, wie wir beim Entwickeln und Gestalten der Rezepte hatten und wünschen ein freudiges Kochen und ein Gutes!

Mito-Nuclear Communication by Mitochondrial Metabolites and Its Regulation by B-Vitamins

Janssen JEJ et al, Front Physiol 2019; 10:78



Regulatory role of B-vitamins in mitochondrial and cytosolic metabolic reactions.

The impact of COVID-19 on youth mental health: A mixed methods survey

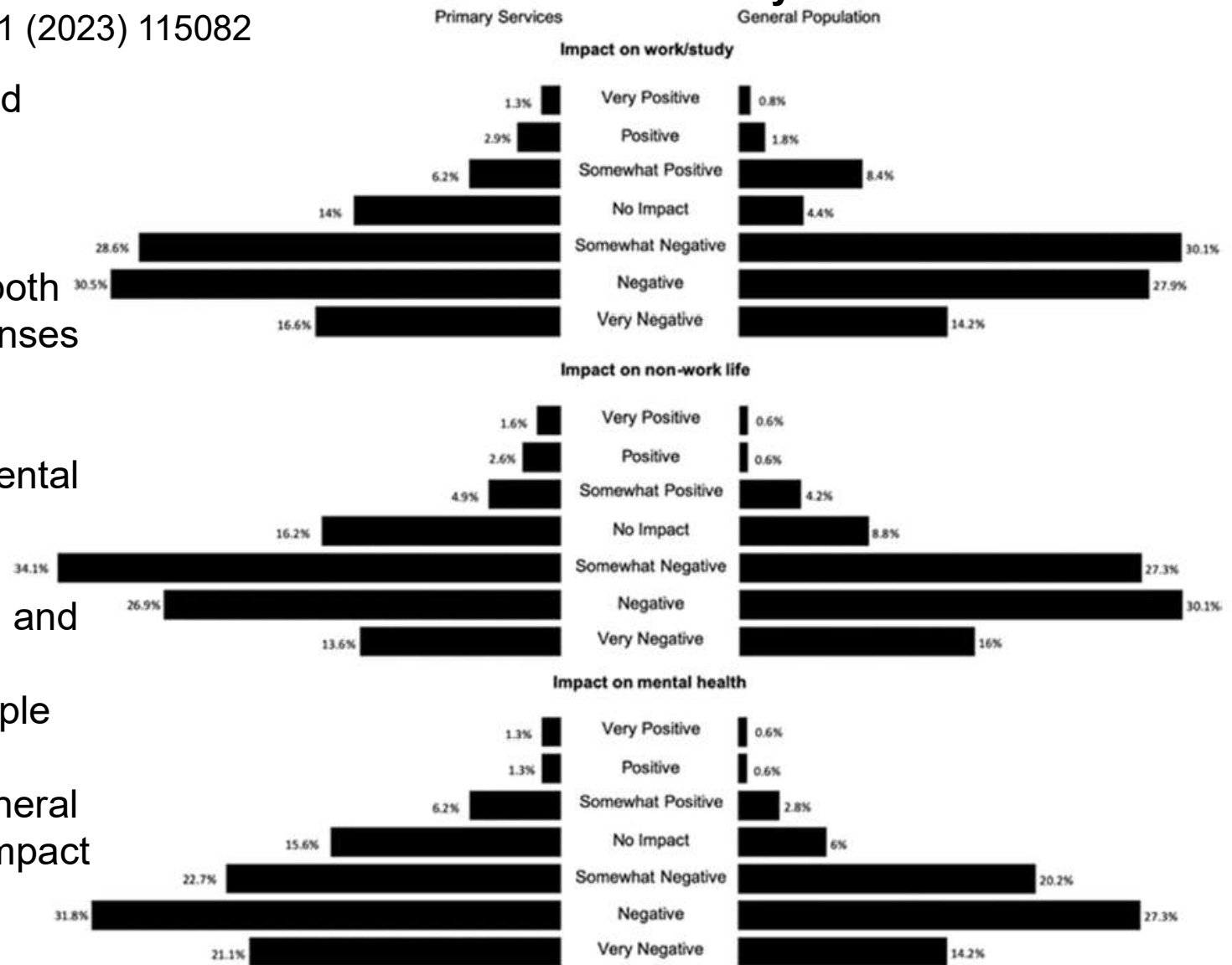
Bell IH et al, Psychiatry Research 321 (2023) 115082

The pandemic presented profound disruptions to young people at a critical period of psychosocial development.

Method: online survey including both quantitative and qualitative responses captured positive and negative impacts of COVID-19 across 593 young people with and without mental health care needs.

Results: high levels of clinical depression (48%), anxiety (51%), and loneliness in both samples.

Approximately 75% of young people in primary mental health care services, and over 80% in the general population, reported a negative impact on work, non-work activities and mental health and wellbeing.



- Malnutrition chez les enfants en Suisse: la précarité croissante dans la population aboutit à une réduction du budget alloué à l'alimentation. Les enfants subissent. Les aliments bon-marché sont pauvres en micronutriments essentiels pour le fonctionnement cérébral et la croissance. Les fréquents déficits en fer, zinc et omega-3 favorisent dépression et angoisse.
- Nutriscore : Ce score a été développé sur des bases épidémiologiques solides et relève d'une collaboration entre 7 pays (DE, BE, ES, FR, LX, NL, CH), et permet l'évaluation rapide par le consommateur des produits nutritionnels industriels transformés et ultra-transformés. Ce score va de A (excellent) à E (à limiter) et permet choix éclairés. L'algorithme de calcul a évolué en 2025. Obligatoire en France, il ne l'est pas en CH (lobbys ont gagné).
- Nutrition pendant les examens: la tentation de simplifier l'alimentation pdt les examens est grande (consommation prédominante d'hydrates de carbone), mais elle est contreproductive et néfaste à court et long terme. Les effets sur le cerveau sont une augmentation du stress et de l'angoisse, et une réduction de la capacité de mémorisation. Au contraire, avec une alimentation équilibrée et enrichie en omega-3 PUFA, les membranes sont fluidifiées, et le cerveau fonctionne/mémorise mieux.