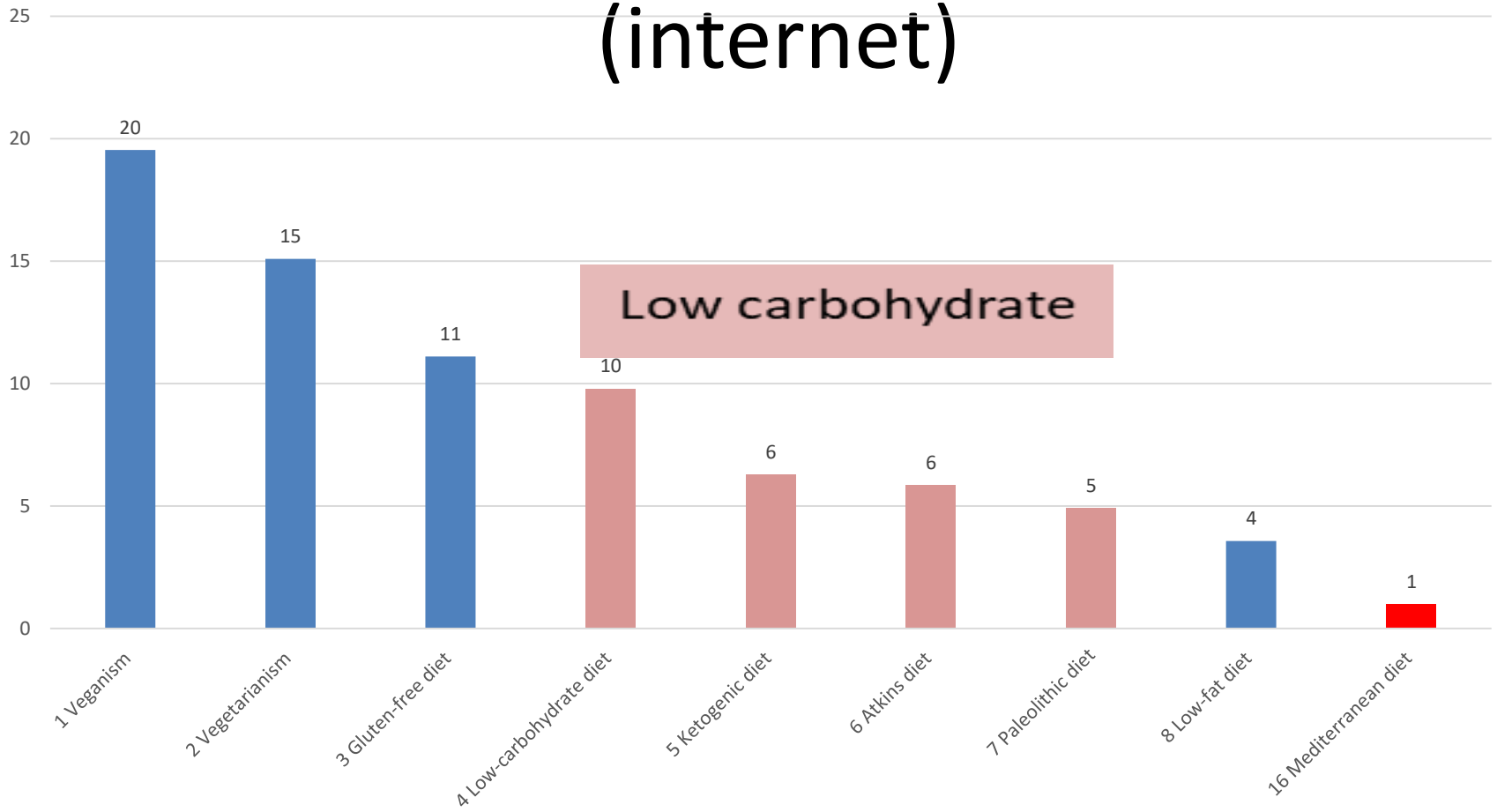
ALTERNATIVE DIETS

MUDr. Eva Kudlová, CSc.

First Faculty of Medicine, Charles University and

General University hospital in Prague

Popularity of diet-related topics in proportion to “Mediterranean diet„ (internet)

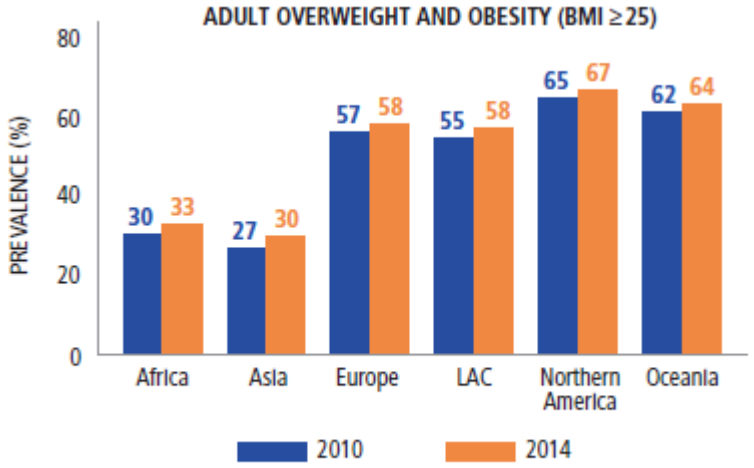


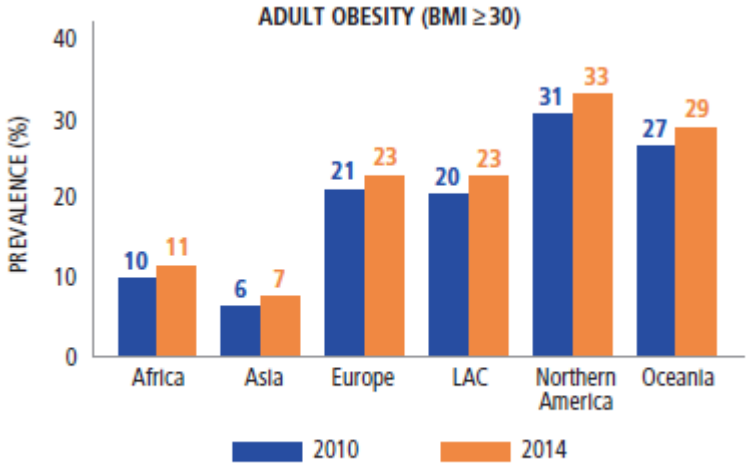
Kamiński M et al. 2020

Wide range of dietary patterns

- Dietary guidelines developed by authoritative bodies worldwide based on systematic reviews conclude that a wide range of dietary patterns are consistent with a healthy diet.
  - http://www.fao.org/nutrition/education/food-dietary-guidelines/en/
- They consistently advise:
  - limiting intake of saturated fat in favour of monounsaturated and polyunsaturated fats,
  - and limiting sugar and highly refined carbohydrates in favour of wholegrains, fresh fruit, and vegetables.

In the past 30 years – no decline in any country: overweight and obesity INCREASING





Adult overweight and obesity, adult obesity, by UN region, 2010 and2014
Source: Authors, based on data from WHO (2015a).
Note: Raised blood glucose = fasting glucose ≥7.0 mmol/l (126 mg/dl) or on medication for raised blood glucose or with a history of diagnosis of diabetes. BMI = body mass index; LAC = Latin America and the Caribbean. Number of countries = 190. Prevalence data are age-standardized adjusted estimates (population age 18+ years). Regional estimates are population-weighted means.

International Food Policy Research Institute. 2016. *Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030*. Washington, DC.

Is the obesity due to fat or sugar/carbohydrates?

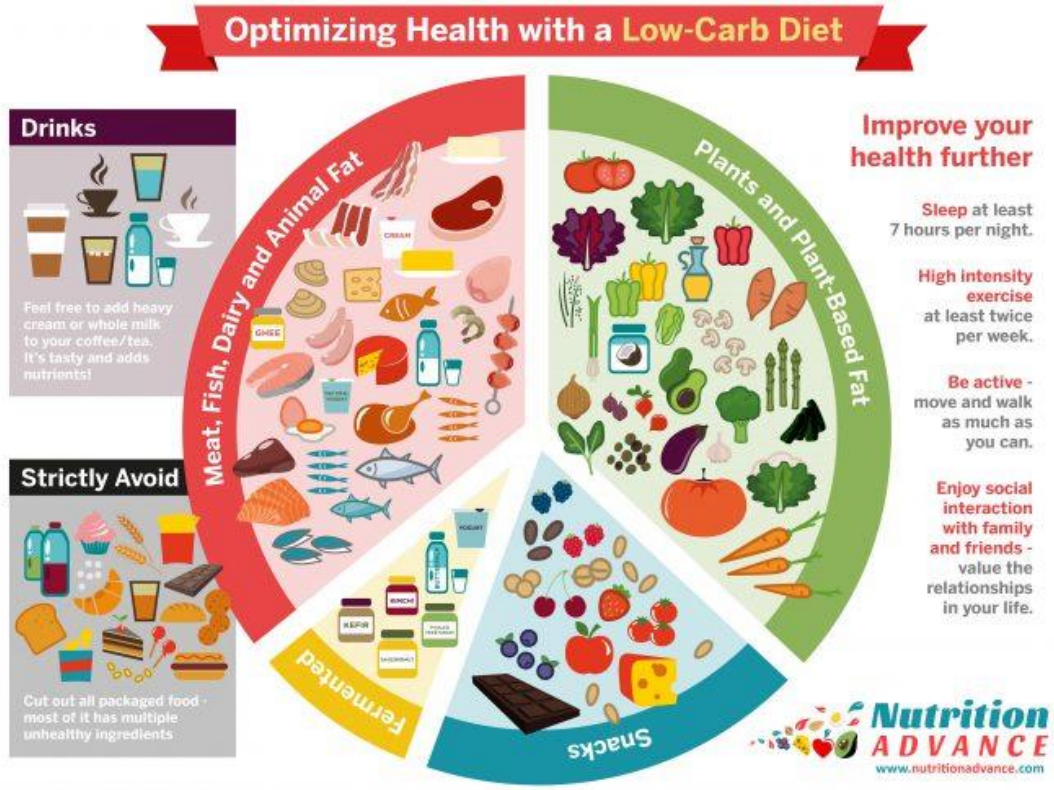
Discussions since 1970s

Low carb diets

Ketogenic diet

Paleolithic diet

LOW CARBOHYDRATE DIETS



Official institutions do NOT recommend low carb diet

Acceptable macronutrient distribution ratio

- WHO
  - Fat (adults) <30 % energy (2015)
  - Carbs 55 – 75 % energy (2003)
- EFSA 2019
  - Fat from 4 years 25 - 35 % energy
  - Carbs from 1 year 45-60 % energy
- DACH 2010
  - Fat (adults) <30 % energy
  - Carbs from 1 year > 50 % energy
- US 2015
  - Fat (adults) 20 – 35% energy
  - Carbs all age groups 45-65% energy

Low carbohydrate diets

- Prospective study representative sample US population: 24 825 participant US National Health and Nutrition Examination Survey (NHANES) 1999 – 2010, average 6.4-year follow-up
- Participants with the lowest carb consumption had a 32% higher risk
  - 32% all-cause death, 51% coronary heart disease, 50%, cerebrovascular disease, and 35%,
- Confirmed in a meta-analysis of 7 prospective cohort studies; 447,506 participants; average follow-up 15.6 years; lowest carbs - higher risk
  - 15% all-cause death, 13% coronary heart disease, 8%, cerebrovascular disease, and 35%,
- Low carb diets might be useful in the short term to lose weight, lower blood pressure, and improve blood glucose control, but in the long-term linked with an increased risk of death

Ketogenic diets (fat ≥70% of energy)

Many modifications

- Atkin's diet in 20th century, now MAD - modif. Atkins
- Classical ketogenic:

Fat 75%

Protein 20%

Carbohydrates 5%

of energy

http://blog.factor75.com/what-is-the-ketogenic-diet/

A SampleMenu of the Standard Ketogenic Diet

- Breakfast:
  - Mushroom and cheese omelet with sliced bacon
- Snack:
  - ½ avocado
- Lunch:
  - Chicken stir-fry with peppers, onions, and peanuts sautéed in peanut oil
- Snack:
  - 1 oz Brie cheese with 1 oz walnuts
- Dinner:
  - Salmon fillet with oven-roasted Brussels sprouts

https://www.everydayhealth.com/diet-nutrition/ketogenic-diet/

Ketogenic diet tried in therapy of neurodegenerative diseases

- Epilepsy,
- Malignant glioma
- Alzheimer's disease
- Parkinson's disease …
- Demonstrated and hypothesized

Mechanisms of influnce:

- metabolic regulation,
- neurotransmission modulation,
- reduced oxidative stress
- anti-inflammatory + genomic effects

brain sciences

MDPI

Review

The Expanding Role of Ketogenic Diets in Adult Neurological Disorders

Tanya J. W. McDonald and Mackenzie C. Cervenka *

Department of Neurology, Johns Hopkins University School of Medicine, 600 North Wolfe Street, Meyer 2-147, Baltimore, MD 21287, USA; twill145@jhmi.edu

* Correspondence: mcerven1@jhmi.edu; Tel.: +1-443-287-0423; Fax: 410-502-2507

Received: 28 June 2018; Accepted: 2 August 2018; Published: 8 August 2018

check for updates

Abstract: The current review highlights the evidence supporting the use of ketogenic diet therapies in the management of adult epilepsy, adult malignant glioma and Alzheimer's disease. An overview of the scientific literature, both preclinical and clinical, in each area is presented and management strategies for addressing adverse effects and compliance are discussed.

Conclusion: The results of studies support use, but their evaluation is limited by the difficulty of dietary intervention (cannot be blinded, compliance difficulty) and the heterogeneity of the studies

PLANT BASED DIETS

What are plant-based diets?

- Diverse range of dietary patterns that emphasize foods derived from plant sources coupled with lower consumption or exclusion of animal products
  - Vegetarian diets form a subset of plant-based diets, which may exclude the consumption of some or all forms of animal foods

Vegetarian diets

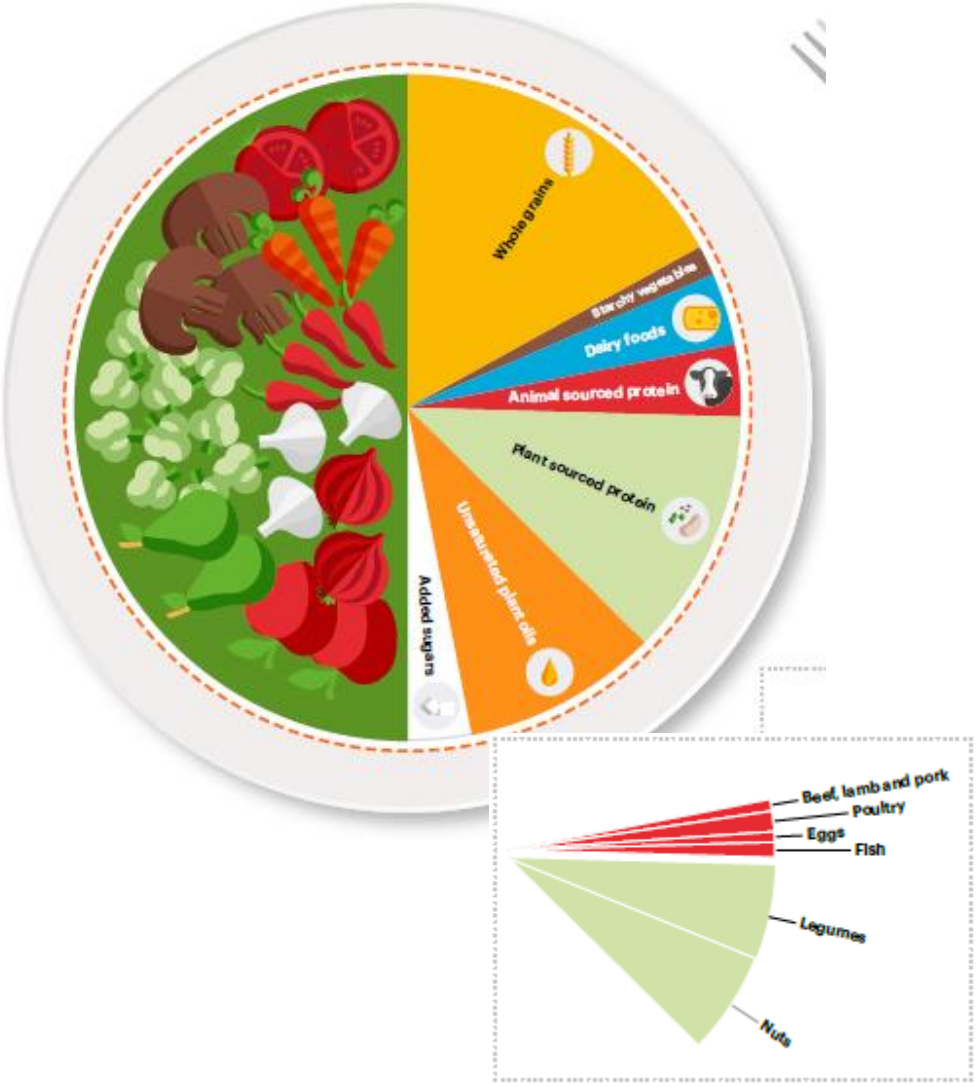
- Vegan
  - omit all animal products, including meat, dairy, fish, eggs and (usually) honey
- Lacto-vegetarian
  - exclude meat, fish, poultry and eggs, but include dairy products such as milk, cheese, yoghurt and butter.
- Lacto-ovo vegetarian
  - include eggs and dairy, but not meat or fish.
- Ovo-vegetarian
  - exclude meat, poultry, seafood and dairy products, but allow eggs.
- Pesco-vegetarian (or pescatarian)
  - include fish, dairy and eggs, but not meat
- Semi-vegetarian (or flexitarian)
  - primarily vegetarian but include meat, dairy, eggs, poultry and fish on occasion, or in small quantities

Semi-vegetarian / Flexitarian

https://assets1.progressivegrocer.com/files/styles/content_sm/s3/2018-08/Flexitarian.jpg?itok=XoqUElmA

- Added to the Oxford English Dictionary in 2014: "flexible" and "vegetarian,"
- A flexitarian or semi-vegetarian diet (SVD) is one that is primarily vegetarian with the occasional inclusion of meat or fish
  - E.g. ≥ once/month + <once/week
- There appears to be an increasing movement toward this practice

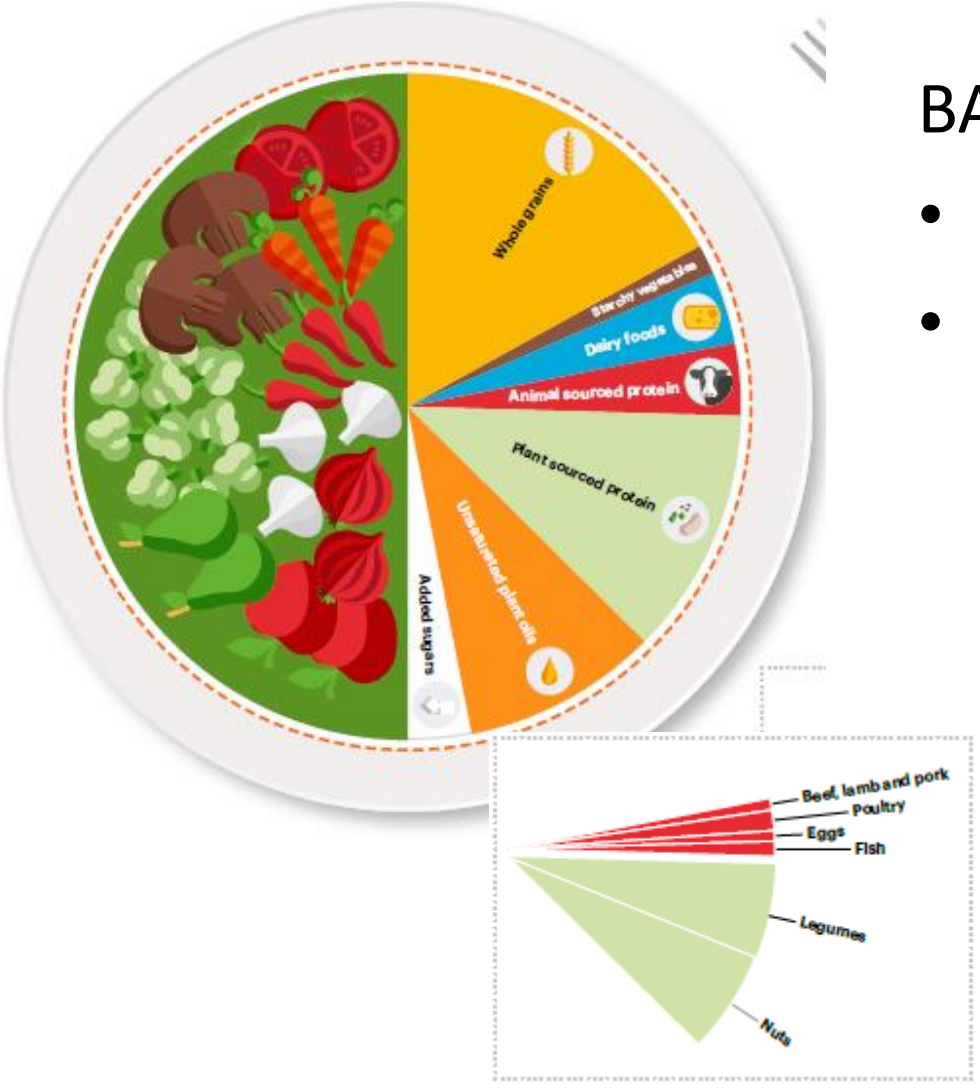
EAT 2019: Global reference diet - flexitarian



- EAT (science-based global platform for food system transformation) + Lancet: commission of 37 experts from different fields
- 2019 report what the ideal diet of the future should look like
- Based on the best evidence for
  - healthy diet
  - from sustainable food systems

https://eatforum.org/about/ https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/

EAT 2019: Global reference d

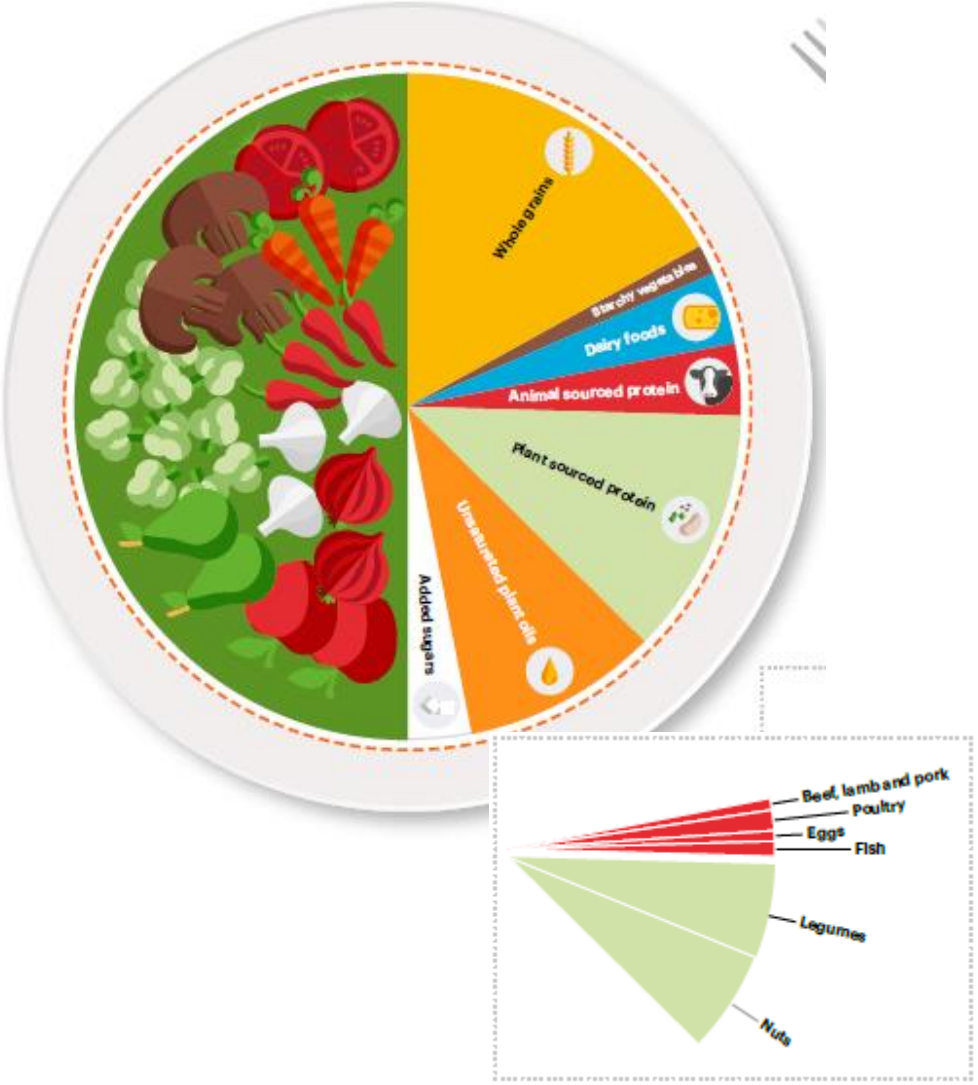


BASED ON:

- ½ vegetables and fruits
- ½ (by % of energy)
  - whole grain foods,
  - plant protein sources,
  - unsaturated vegetable oils

https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/

EAT 2019: Global reference diet



LITTLE

- animal protein sources
- Refined cereals
- Saturated fat
- Ultra- processed foods
- Added sugar

https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/

EAT 2019: Global reference diet

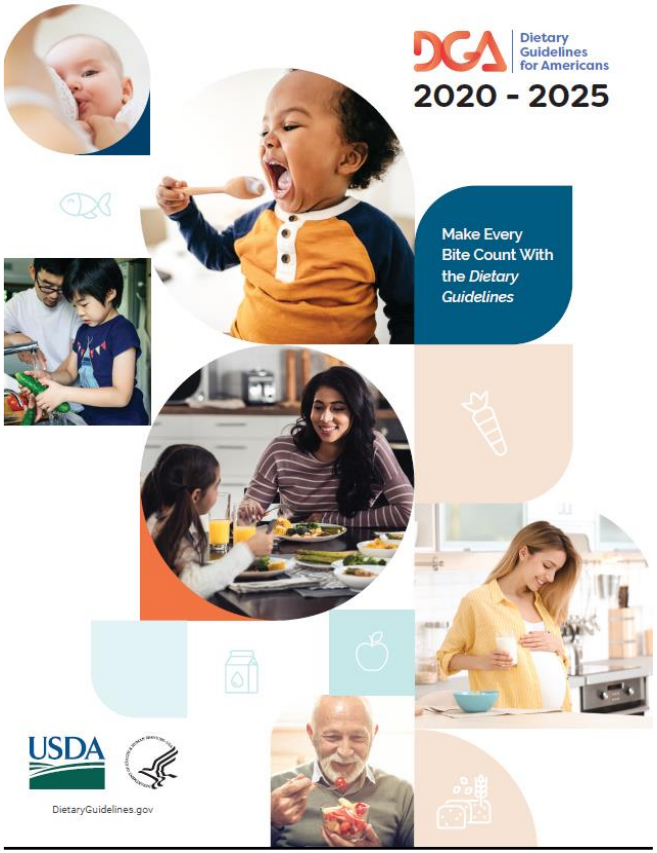
	Macronutrient intake grams per day (possible range)	Caloric intake kcal per day
Whole grains		
Rice, wheat, corn and other	232	811
Tubers or starchy vegetables		
Potatoes and cassava	50 (0–100)	39
Vegetables		
All vegetables	300 (200–600)	78
Fruits		
All fruits	200 (100–300)	126
Dairy foods		
Whole milk or equivalents	250 (0–500)	153
Protein sources		
Beef, lamb and pork	14 (0–28)	30
Chicken and other poultry	29 (0–58)	62
Eggs	13 (0–25)	19
Fish	28 (0–100)	40
Legumes	75 (0–100)	284
Nuts	50 (0–75)	291
Added fats		
Unsaturated oils	40 (20–80)	354
Saturated oils	11.8 (0-11.8)	96
Added sugars		
All sugars	31 (0–31)	120

- Does not mean that everyone should eat the same
- Intake ranges of foods provided
- Local adaptation required

https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/

2015–2020 Dietary Guidelines for Americans

- The Healthy U.S.-Style
- The Healthy Mediterranean-Style
- The Healthy Vegetarian (lacto-ovo)
- 3 examples of healthy eating patterns that can be adapted based on cultural and personal preferences

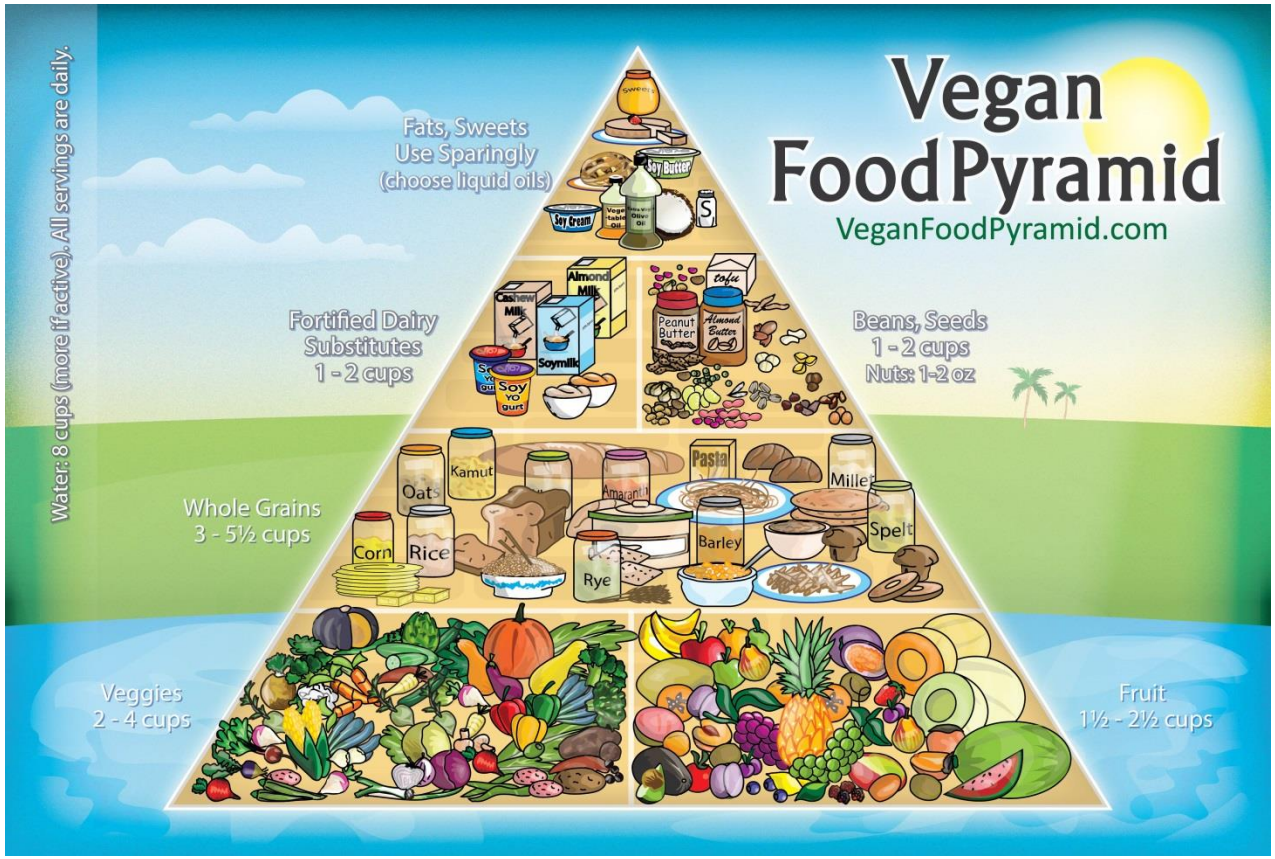


U.S. Department of Health and Human Services and U.S. Department of Agriculture *Dietary Guidelines for Americans, 2020-2025.* 9th Edition. https://www.dietaryguidelines.gov/

1 Cup 237ml, Oz 28,35 g, fl.oz 29,6 ml

US (Lakto-ovo)vegetarian diet: comparison with Heathy US diet

	Healthy U.S.	Healthy Vegetarian
Group[a]	Amount[b]	
Vegetables	2½ c-eq/day	2½ c-eq/day
Dark Green	1½ c-eq/wk	1½ c-eq/week
Red & Orange	5½ c-eq/wk	5½ c-eq/week
Legumes (Beans & Peas)	1½ c-eq/wk	3 c-eq/week[c]
Starchy	5 c-eq/wk	5 c-eq/week
Other	4 c-eq/wk	4 c-eq/week
Fruits	2 c-eq/day	2 c-eq/day
Grains	6 oz-eq/day	6½ oz-eq/day
Whole Grains	≥ 3 oz-eq/day	≥3½ oz-eq/day
Refined Grains	≤ 3 oz-eq/day	≤3 oz-eq/day
Dairy	3 c-eq/day	3 c-eq/day
Protein Foods	5½ oz-eq/day	3½ oz-eq/day[c]
Seafood	8 oz-eq/wk	—
Meats, Poultry, Eggs	26 oz-eq/wk	3 oz-eq/wk (eggs)
Nuts, Seeds, Soy Products	5 oz-eq/wk	14 oz-eq/week
Oils	27 g/day	27 g/day
Limit on Calories for Other Uses (% of Calories)c	270 kcal/day (14%)	290 kcal/day (15%)



http://veganfoodpyramid.com/

Vegetarian diets - Observational studies

- Lower
  - risk factors for metabolic and cardiovascular diseases,
  - risk of cancer and ischemic heart disease,
  - Risk of death from ischemic heart disease
- May be associated with
  - a higher incidence of bone fractures,
  - mental health (eating disorders, anxiety, depression)
- Especially veganism: specific deficiencies of some nutrients

Consumers need to know about the appropriate composition of the diet

THE EXCLUSION OF ANIMAL FOODS FROM THE DIET DOES NOT IN ITSELF ENSURE ITS GOOD QUALITY

Vegan mom gets life in prison for starvation death of son

A vegan woman convicted of murder in the malnutrition death of her young son has been sentenced to life in prison

Via AP news wire • Monday 29 August 2022 21:09

Vegan mom gets life in prison for starvation death of son

Show all 2

Nutrients potentially critical in vegan diet

- Protein
- Long-chain n-3 fatty acids

  (eicosapentaenoic acid - EPA and docosahexaenoic acid - DHA)
- vitamins D, B2 and B12,
- calcium, iron, iodine, zinc and selenium

B12 – most critical nutrient

Plant sources: protein

- legumes,
- nuts,
- cereals (whole-grain),
- oil seeds,
- potatoes

Recommendation:

- Combine sources consume over the day e.g. cereals + legumes, soya products and/or oil seeds
- Consume more than recommended for general population (lower digestibility)

Plant sources of polyunsaturated n-3 fatty acids

- Sufficient only alpha-linolenic acid (ALA, 18: 3, n-3)
  - It forms eicosapentaenoic acid (EPA, 20: 5 n-3) and docosahexaenoic acid (DHA, 22: 6 n-3) - a process that is not very efficient
- Formation of EPA and DHA from ALA
  - can be suppressed by a high intake of n-6 linoleic acid (LA), therefore the LA / ALA ratio should not exceed 4:1
  - also affected by the content of a whole range of nutrients in the diet
- Recommendation
  - consumption of ALA sources (e.g. rapeseed, flax, chia, hemp, walnuts and their oils)
  - limiting the intake of LA sources (e.g. corn and sunflower oil)
  - a varied diet helps the conversion of ALA to EPA and DHA
  - food fortified with oil from microalgae

Sources of vitamin B12

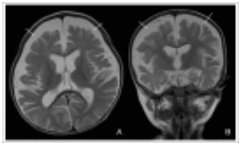
Formation: only some bacteria + archaea

- Ruminants get B12 from symbiosis with bacteria in their stomachs
- Phytoplankton: B12 symbiosis with bacteria … food for other aquatic animals
- Some algae - recommended, but:
  - mostly inactive analogues - interfere with the absorption of active forms of B12 possible cytototoxins, anatoxins, Al, Ni, Pb
- Recommendation: Nutritional supplements - the only reliable source for vegans

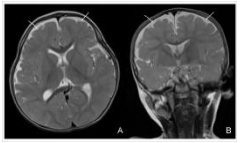
Cerebral atrophy in a vitamin B12-deficient infant of a vegetarian mother

- 12-month-old Turkish child born at term, 3,500 g exclusively breastfed, mother on a vegetarian diet for many years; normal development until 6 months, then stopped gaining weight and was less active

- During admission and hospitalization:
  - Lethargic, generally hypotonic, lacking smiling and failing to follow objects visually
  - Rhagades around the angles of both eyelids and mouth
  - Megaloblastic anemia
  - Cortical atrophy and enlargement of the subarachnoid space



- After administration of B12, rapid return to the neurological norm, control MR after 3 months normal
- The rate of recovery varies from person to person, sometimes moderate to severe mental retardation remains



Plant sources: Iron

- Legumes
- Oilseeds, nuts,
- Whole grains
- Vegetables (e.g. spinach)

Recommendation:

- Higher intake than recommendation for general population
- Increase iron bioavailability by:
  - Eating ascorbic acid-rich foods together with iron-rich foods
  - Using food preparation methods such as grinding, soaking and germination, and using sour-dough bread (lowers the phytic acid content of cereals and legumes and thus reduce iron sequestration

Plant sources zinc:

- whole grains,
- legumes,
- oil seeds, nuts

Recommendation:

- Higher intake than recommended for the general population
- Simultaneous consumption of foods rich in zinc and foods with organic acids (fruits and vegetables of the cruciferous family - cabbage, cabbage, cauliflower, radish, Brussels sprouts, broccoli, Peking cabbage)
- Increase absorption: soaking, sprouting, fermentation, leavening bread (reduce phytates in zinc-rich foods)

Plant sources: vitamins B2 + D

Vitamin B2 (Riboflavin)	**Oil seeds, nuts, legumes, various types of vegetable (e.g. broccoli, kale) and whole-grain cereals** **Recommendation: Varied diet**
Vitamin D	**Unreliable source: some mushrooms** **Recommendation: Sunlight, supplements**

Plant sources: Iodine, selenium, calcium

Iodine	**Iodized table salt and foods prepared from it** **Seaweed with a moderate iodine content, e.g. Nori** **Recommendation: See sources**
Selenium	**Cabbage, broccoli, garlic, onions, mushrooms, asparagus, legumes, Brazil nuts (the amount depends on the selenium content on which the food was grown)** **Recommendation: See sources**
Calcium	**Vegetables with low content of phytates and oxalates (e.g. broccoli, cabbage, rocket), nuts (e.g. Hazelnuts, Brazil nuts), legumes, soy meat products, tofu, mineral water with calcium content >150 mg/l** **Recommendation: See sources**

INTERMITTENT FASTING

Intermittent fasting: main types

- **Alternate day fasting,** which typically involves a feast day alternated with a fast day where **500 calories** are consumed in one meal.
- **5:2 diet,** a modified version of alternate day fasting that involves five feast days and two fast days per week.
- **Time-restricted eating**, which confines eating to a specified number of hours per day, usually four to 10 hours, with no calorie restrictions during the eating period.

Intermittent fasting

- Promising strategies to target many clinical parameters - foundation for metabolic syndrome, CVD, cancer, and neurodegenerative diseases
- Specific mechanisms are not fully understood but periodic absence of energy intake appears to improve multiple risk factors and, in some cases, reverse disease progression in mice and humans.
- Most experiments have been limited to a few inbred mouse strains
- Promising but still experimental and should not be initiated without medical supervision.

Andrea Di Francesco et al. Science 2018;362:770-775; de Cabo at al. Effects of Intermittent Fasting on Health, Aging, and Disease. New England Journal of Medicine, 2019; 381 (26): 2541

Who should not intermittent fast

- Those who are pregnant or lactating
- Children under 12
- Those with a history of eating disorder
- Those with a body mass index, or BMI, less than 18.5
- Shift workers
  - Studies have shown they may struggle with fasting regimens because of shifting work schedules.
- Those who need to take medication with food at regimented times

Varady, KA 2021

Many studies in recent years

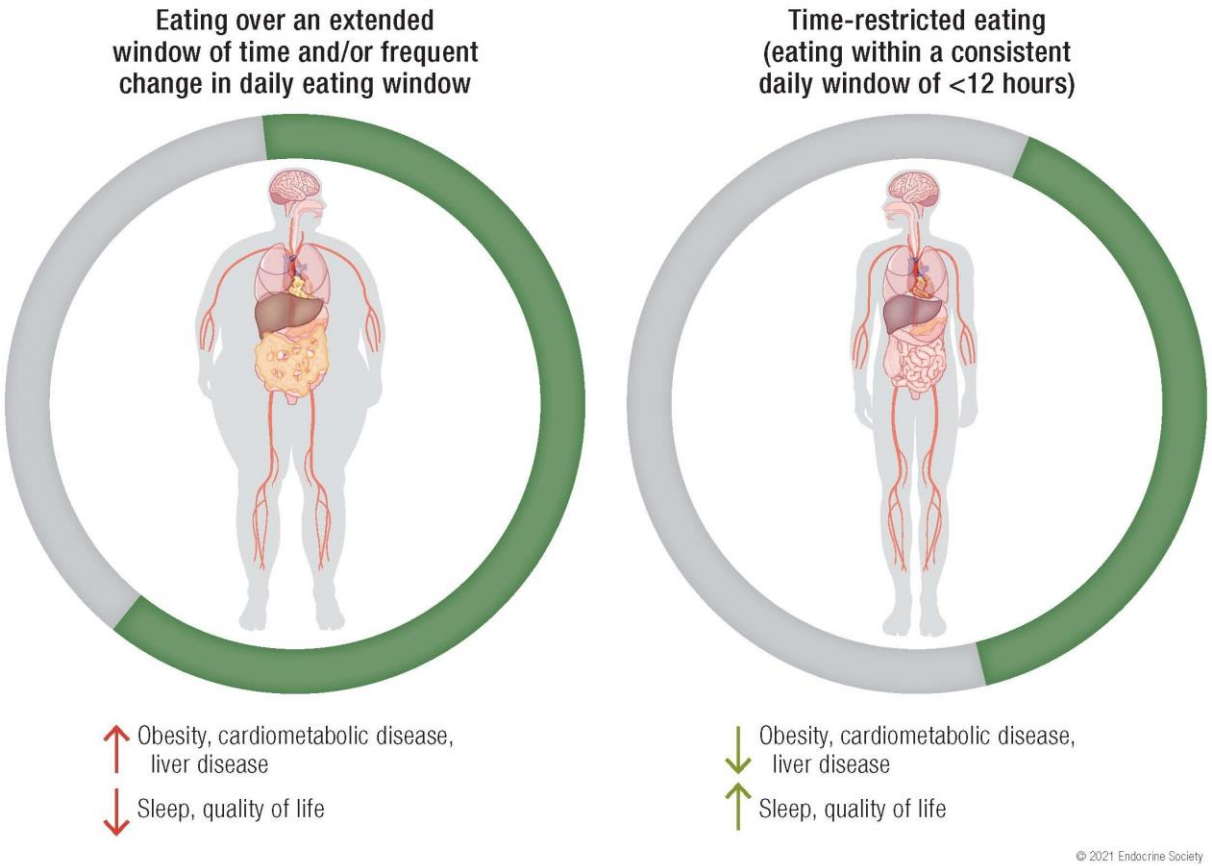
TIME RESTRICTED EATING (TRE - HUMANS)/FEEDING (TRF - ANIMALS

Time restricted eating/feeding

(TRE – humans;TRF - animals)

- Daily caloric intake is restricted to a consistent window of approximately 8 to 10 hours.
- Based on the concepts of circadian rhythm and in animal models is shown to improve metabolism by at least partly acting through the molecular circadian clock.
- In animals, TRF without reducing caloric intake
  - prevents or attenuates severity of several metabolic diseases, including obesity, glucose intolerance, hepatic steatosis, dyslipidemia, and age-related decline in cardiac function
- In pilot human studies, TRE with or without explicit calorie reduction
  - can reduce body weight, glucose intolerance, hypertension, and dyslipidemia.
- Molecular studies on animals show TRF exerts pleiotropic effects on multiple pathways in different organs and on gut microbiome composition.
- Better methods to monitor and promote compliance to a daily eating pattern in humans is necessary to accurately assess TRE benefits.

Graphical Abstract

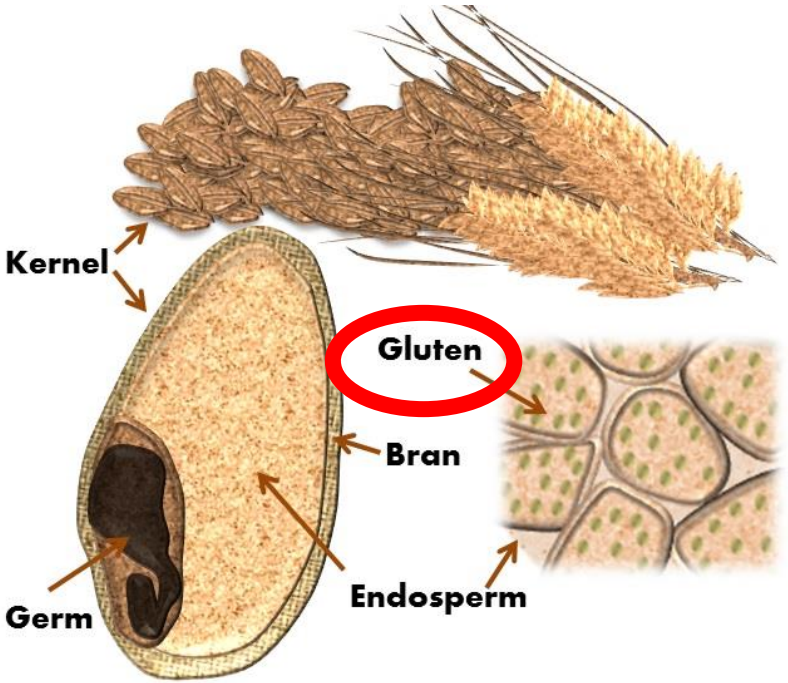


Endocr Rev, bnab027, https://doi.org/10.1210/endrev/bnab027

GLUTEN FREE DIET

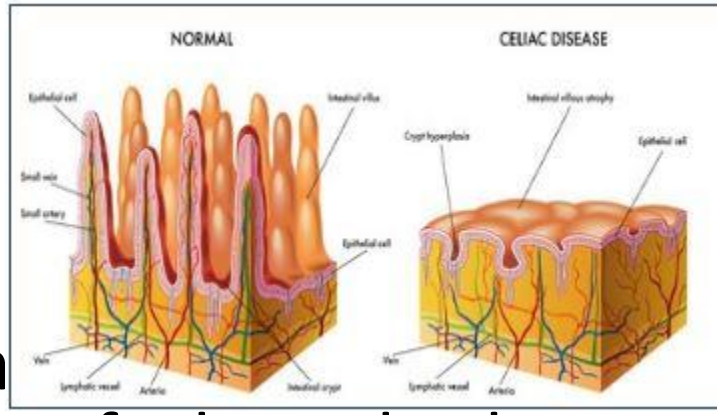
Gluten

- Mixture of storage proteins prolamins conjoined with starch in wheat, barley, rye and some oats cultivars
- Improves a dough's ability to rise and increases the bread's structural stability and chewiness



The Gluten protein is mainly found in the endosperm of grain Kernel (seed)

Celiac disease



- A chronic, immune-mediated m process, caused by the ingestion of wheat, barley, rye, and derivatives that appears in genetically predisposed people of all ages.
  - CD with "classic symptoms" – children <2 years: chronic diarrhea and abdominal distention, malabsorption, loss of appetite, and impaired growth - currently the least common presentation
  - Other age groups: milder or absent gastrointestinal symptoms and a wide spectrum manifestations that can involve any organ of the body, and very frequently
  - May often be completely asymptomatic.

Other gluten related disorders

- **Non-celiac gluten sensitivity** (NCGS)
  - a condition of multiple symptoms that improves when switching to a gluten-free diet, after celiac disease and wheat allergy are excluded.
- **Wheat allergy** often time-limited and does not cause lasting harm to body tissues
  - Gastrointestinal symptoms of wheat allergy are similar to those of celiac disease and non-celiac gluten sensitivity
  - An allergic reaction to wheat has a fast onset (from minutes to hours) after the consumption of food containing wheat and could include anaphylaxis

Gluten-free diet without a medical indication

- „I feel better “
  - Some may have non-diagnosed gluten related disorder
  - Placebo effect
- Suitable for weight reduction? Depends …. :
  - YES, if gluten containing grains are replaced by foods as potatoes, rice, millet ….
  - NO, if the usual sweet/fatty cereal products are replaced by the same but gluten/free

Gluten-free and regular foods: a cost comparison (Stevens L, Rashid M 2008)

- 56 gluten-free products were, on average, 242% more expensive than regular products

THE MOST EXTREME OF ALTERNATIVE DIETS

Thanks