



Dietary advice for brain health

Partially hydrogenated oils are a major source of artificial *trans* fat used in the food industry. Being more stable in the frying process and giving food an extended shelf-life, the oils are commonly found in processed food such as baked products, frozen food, and creamer. However, since the 1990s, concern has been raised as *trans* fat was associated with heightened risks of cardiovascular disease and type 2 diabetes, which ultimately brought a ban of the oils in the U.S. in 2015 ¹.

There is yet a legal limitation set on *trans* fat in Asian countries. However, the World Health Organization (WHO) has called for a global elimination of artificial *trans* fat from the food industry for the reduction in chronic diseases ².

Cardiovascular disease and diabetes, two health issues associated with *trans* fat, are identified risk factors of Alzheimer's disease, but *trans* fat has also been found to directly affect cognitive health in adults young and old alike. Clinical investigations of 104 community-dwelling older adults showed that higher *trans* fat intake was associated with lower total cerebral brain volume and cognitive performance, indicating both a structural and performance effect of the fatty acid on brain health ³. A longitudinal study following 815 community-residing older adults showed that both *trans* fat and saturated fat increased the risk of Alzheimer's disease ⁴. A cross-sectional study analyzing dietary pattern and cognitive function in men during 1999-2005 also reported a negative correlation between dietary *trans* fat intake and word recall performance. Among adult men aged 45 or below, each additional gram of daily *trans* fat weakened the ability of recall by 0.76 words ⁵.

It is notable that *trans* fat may also disturb cognitive functions as a combined effect with other dietary components. A study that investigated the copper intake pattern of 3,718 older adults reported that those who have a high intake in saturated fat, *trans* fat, and copper had a faster rate of cognitive decline, while high copper intake alone was not associated with the same decline. The study also found that among older adults who consumed a large amount of fat, those who had the top 20% copper intake had a faster cognitive decline equivalent to 19 years of age ⁶.

According to WHO, the daily consumption of *trans* fat should be kept below 1% of the total energy intake ⁷, thus an adult with a daily intake of 2,000 kcal should limit the daily consumption of *trans* fat to less than 2.2 grams ⁸. The Centre for Food Safety advised cautious selection of food as laboratory analyses found several commonly-consumed food items high in *trans* fat. For example, the amount of *trans* fat in a piece of Portuguese egg tart



is approximately 0.4 grams, and in a cream bun as high as 1.5 grams. It was noticed that the portion of *trans* fat may vary largely across the same genera of food from different brands, such as egg rolls, which varied from 0 to 1 gram of *trans* fat per 100 grams; without paying attention to the nutrition label, consuming half of a 28-piece egg roll could already exceed the recommended intake. At the same time, the accumulative amount of *trans* fat is not to be overlooked. For instance, although a pineapple bun contains only 0.1 gram of *trans* fat, sandwich it with butter adds up to 0.4 gram of *trans* fat. Other than *trans* fat, the amount of saturated fat in fast food chains also called for attention. It was reported that a nine-piece serving of chicken nuggets contained 14 grams of saturated fat, which took up 64% of the WHO-recommended 2.2 grams for a diet pattern of 2,000 kcal intake a day^{9,10}.

Meanwhile, vegetable oils high in polyunsaturated fat (PUFA) and monounsaturated fat (MUFA) are recommended as healthy alternatives⁷, and the Mediterranean diet is recognized for its hazard-protective properties for these components. With a large amount of olive oil as a major fat intake, the Mediterranean diet is also characterized by high intake of fruits, vegetables, whole grains, legumes, and fish, which combine to promote anti-inflammatory and anti-oxidizing effects. A higher adherence to the diet has been found to reduce the risk of developing mild cognitive impairment, and the risk of progressing from mild cognitive impairment to Alzheimer's disease^{11,12}. In a randomized-controlled trial, 447 older adults were assigned to a Mediterranean diet supplemented with olive oil or mixed nuts, or a control diet. Cognitive tests after a mean follow-up of four years found the two Mediterranean diet group had improved cognitive performance while the control group deteriorated, showing the potential of the dietary pattern to delay or reduce the effects of cognitive decline¹³.

Besides the traditional Mediterranean diet, an effort has also been made to acquire the principals into local cuisine¹⁴. A large-scale intervention consisted of exercise, cognitive training, vascular risk monitoring, and a diet made up of high consumption of fruits and vegetables, whole grains, fish, and limited consumption of dietary fat showed significant benefits on cognitive performance, executive functioning, and processing speed, thereby supporting the hypothesis that multidisciplinary changes in daily habits could protect cognition^{15,16}.

References

1. U.S. Food and Drug Administration. FDA Cuts Trans Fat in Processed Foods. 2015; <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm372915.htm>.
2. Downs SM, Thow AM, Leeder SR. The effectiveness of policies for reducing dietary



- trans fat: a systematic review of the evidence. *Bulletin of the World Health Organization*. 2013;91(4):262-269h.
3. Bowman G, Silbert L, Howieson D, et al. Nutrient biomarker patterns, cognitive function, and MRI measures of brain aging. *Neurology*. 2012;78(4):241-249.
 4. Morris MC, Evans DA, Bienias JL, et al. Dietary fats and the risk of incident Alzheimer disease. *Archives of neurology*. 2003;60(2):194-200.
 5. Golomb BA, Bui AK. A Fat to Forget: Trans Fat Consumption and Memory. *PloS one*. 2015;10(6):e0128129.
 6. Morris MC, Evans DA, Tangney CC, et al. Dietary copper and high saturated and trans fat intakes associated with cognitive decline. *Archives of neurology*. 2006;63(8):1085-1088.
 7. Uauy R, Aro A, Clarke R, et al. WHO Scientific Update on trans fatty acids: summary and conclusions. *European Journal of Clinical Nutrition*. 2009;63:S68-S75.
 8. Centre for Food Safety. FAQ on Trans Fats. 2007;
http://www.cfs.gov.hk/english/faq/faq_13.html, 2015.
 9. Centre for Food Safety. Trans Fats in Locally Available Foods (Part I). 2007;
http://www.cfs.gov.hk/tc_chi/programme/programme_rafs/programme_rafs_n_01_05.html.
 10. Centre for Food Safety. Trans Fats in Locally Available Foods (Part 2). 2008;
http://www.cfs.gov.hk/tc_chi/programme/programme_rafs/programme_rafs_n_01_07.html.
 11. Lok KY-W, Chan RS-M, Woo J. The Role of Nutrition in Successful Aging. *Successful Aging*: Springer; 2015:231-250.
 12. Cheung B, Ho I, Chan R, Sea M, Woo J. Current evidence on dietary pattern and cognitive function. *Adv Food Nutr Res*. 2014;71:137-163.
 13. Valls-Pedret C, Sala-Vila A, Serra-Mir M, et al. Mediterranean Diet and Age-Related Cognitive Decline: A Randomized Clinical Trial. *JAMA internal medicine*. 2015.
 14. Bere E, Brug J. Towards health-promoting and environmentally friendly regional diets—a Nordic example. *Public health nutrition*. 2009;12(01):91-96.
 15. Kivipelto M, Solomon A, Ahtiluoto S, et al. The Finnish geriatric intervention study to



prevent cognitive impairment and disability (FINGER): study design and progress. *Alzheimer's & Dementia*. 2013;9(6):657-665.

16. Ngandu T, Lehtisalo J, Solomon A, et al. A 2 year multidomain intervention of diet, exercise, cognitive training, and vascular risk monitoring versus control to prevent cognitive decline in at-risk elderly people (FINGER): a randomised controlled trial. *The Lancet*. 2015.