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Nutrition and the Brain

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•Disclosure: Owner of the Nedley Clinic and Nedley Health Solutions

Neil Nedley, M.D. discloses that he is the owner of the Nedley Clinic and Nedley Health Solutions. 11/10/2015 slides draft

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Nutrition Hits

- Possibly the most overlooked cause of diminished mental power
- Can have profound effects
- Once a nutrition change is adopted, it takes 7 to 10 days to begin noticing a difference
- Gradual improvement continues
- Peaks at 3 to 6 months



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Clues of a “Nutrition Hit”

- Dietary Inventory indicates a lot of junk food and/or meat
- Signs of a carbohydrate addict
 - Sugar temporarily increases brain serotonin levels, helping the person “feel better.”
- Low serum B-12 or folate
- Often no obvious clues are present



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Nutrition Hits

- Insufficient dietary tryptophan
- Converted to serotonin, melatonin, and niacin (vitamin B3)
- Least abundant amino acid in the diet
- The conversion of tryptophan to 5HTP is inhibited by stress, insulin resistance, magnesium or vitamin B6 deficiency, lack of light, and increasing age.

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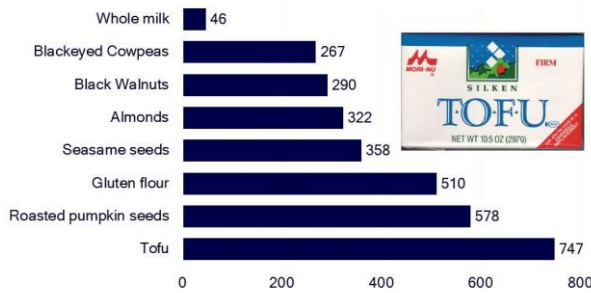
Tryptophan improves

- Premenstrual dysphoria from ovulation (mid-cycle) to the 3rd day of menstruation
- Depression and seasonal affective disorder (SAD)
- Insomnia
- Obstructive sleep apnea
- Nicotine withdrawal

Alternative Medicine Review Volume 11, Number 1 2006

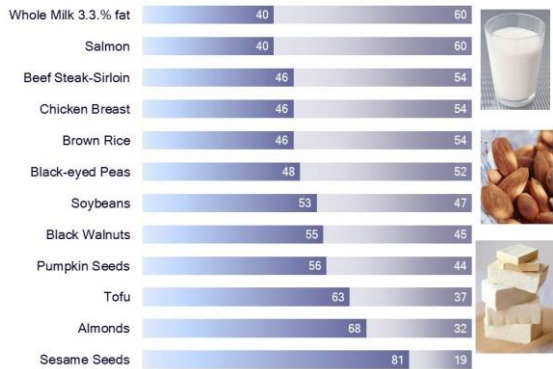
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Foods Rich in Tryptophan (mg/100 grams)



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Ratio of Tryptophan to 5 Amino Acids



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Stress Prone Subjects and Nutrition

- In stress-prone subjects, high carbohydrate, low protein food prevents a deterioration of mood and performance under uncontrollable laboratory stress conditions.
- Stress-prone subjects have a higher risk of brain serotonin deficiency
 - In such subjects, higher natural carbohydrates increase personal control
 - Carbohydrates prevent a functional shortage of central serotonin during acute stress, due to their potentiating effect on brain tryptophan

Markus CR, Panhuysen G, Tuiten A, Koppeschaar H, Fekkes D, Peters ML. Does carbohydrate-rich, protein-poor food prevent a deterioration of mood and cognitive performance of stress-prone subjects when subjected to a stressful task? *Appetite*. 1998 Aug;31(1):49-65.

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Advantages of Tyrosine

- Tyrosine is incorporated into proteins of all life forms and is a precursor for synthesis of thyroxin, melanin, enkephalins, and the neurotransmitters dopamine and norepinephrine.
- Potent antioxidant and also stimulates growth hormone production.
- May be of therapeutic benefit in improving depression, hypertension, stress, cognitive function, memory, Parkinson's disease, phenylketonuria, and narcolepsy.

Alternative Medicine Review Volume 12, Number 4 2007

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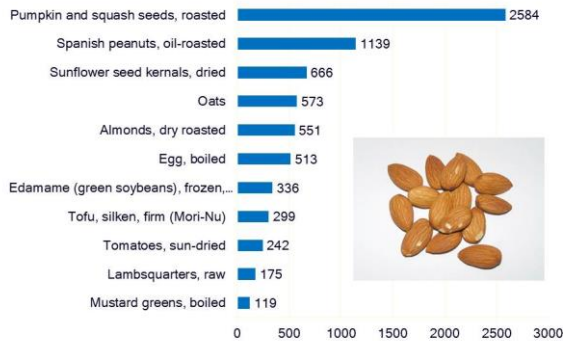
Tyrosine supplementation in response to stress.

- Those given tyrosine had significantly reduced headache, stress, fatigue, muscle aches, and sleepiness compared to controls.
- Improvements were noted in mood and mental states (happiness, mental clarity, hostility, and tension) and cognitive tests (math skills, coding map compass, and pattern recognition) in the tyrosine group.
- Feelings of vigor and improvements in BP

Banderet LE, Leiberman HR. Treatment with tyrosine, a neurotransmitter precursor, reduces environmental stress in humans. Brain Res Bull 1989;22:759-762. Dollins AB, Krock LP, Storm WF, et al. L-tyrosine ameliorates some effects of lower body negative pressure stress. Physiol Behav 1995;57:223-230. Elwes RD, Crewes H, Chesterman LP, et al. 50mg/kg twice daily.

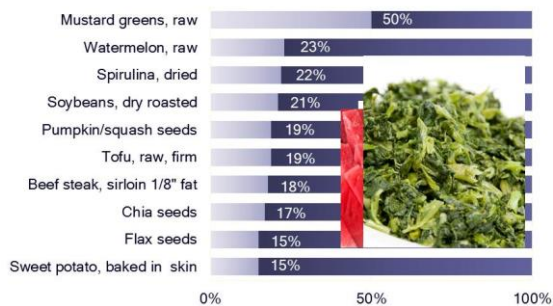
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TYROSINE CONTENT OF FOODS (mg/100g)



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Ratio of tyrosine to 3 COMPETING amino acids



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The Ironic Conclusion

- Don't chow down on high protein sources to boost either tyrosine or tryptophan
- Emphasize carbohydrate-rich plant sources of nutrition

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Nutritional Causes of Depression

- Insufficient dietary tryptophan
- Insufficient dietary tyrosine
- Low folate levels (such depression unresponsive to medication)

Nature Medicine. 1997;4(7):25-30. The Lancet. 1997;349:915-919.
Journal of Clinical Psychiatry. 1998;154(4):497-501.
Am. J. Psychiatry. 1997;154:426-428. Nature. 1997;386:824-827

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Sources of Folate

<i>Amount</i>	<i>Food Item</i>	<i>Folate (mcg)</i>
5½ ounces	Sirloin steak, broiled, trimmed	16
½ cup	Parsnips, raw slices	44
1 cup	Pineapple juice, canned	58
1 cup	Fresh orange juice	75
¼ cup	Spanish peanuts, raw	88
1 cup	Mustard greens, raw	105
1 cup	Spinach, raw	109
1 cup	Navy beans	255
1 cup	Okra pods, frozen	269
1 cup	Lentils	831
1 cup	Black-eyed cowpeas	1057



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Nutritional Causes of Depression

- Insufficient dietary tryptophan
- Low omega-3 fatty acid intake
- Low folate levels (such depression unresponsive to medication)
- Atherosclerosis causing heart disease or mini strokes

Nature Medicine. 1997;4(7):25-30. The Lancet. 1997;349:915-919.
Journal of Clinical Psychiatry. 1998;154(4):497-501.
Am. J. Psychiatry. 1997;154:426-428. Nature. 1997;386:824-827

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High Cholesterol and the Brain

- Patients with major depression tend to have significantly higher cholesterol levels than healthy adults.
- Depressed patients with elevated cholesterol have a poorer prognosis for treatment response.
- Lowering cholesterol levels improve depression and mood, and improve impulsivity.

Papakostas GI, Petersen T, Mischoulon D, Hughes ME, Alpert JE, Nierenberg AA, Rosenbaum JF, Fava M. Serum cholesterol and serotonergic function in major depressive disorder. Psychiatry Res. 2003 May 30;118(2):137-45.

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Cholesterol in Foods

Items (3 oz.)	Chol. (mg)	Items (3 oz.)	Chol. (mg)
Fruits 	0	Egg White	0
Grains	0	Mayonaise	8
Nuts	0	Ice Cream, 1/2c	29
Vegetables	0	Butter, 1 Tbs	31
Milk, non-fat, 1c	4	Egg, 1 large 	213
Milk, 2%, 1c	18	Tuna	26
Milk, whole, 1c	33	Clams	57
		Crab	64

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Cholesterol in Foods

Items (3 oz.)	Chol. (mg)	Items (3 oz.)	Chol. (mg)
Chicken breast, no skin 	73	Shrimp 	165
Pork	76	Beef kidney	329
Beef, sirloin	80	Beef liver	410
Chicken breast & skin	82	Caviar	500
Oyster 	84	Beef brains	1697
Sardines	120		

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Foods Containing Harmful Cholesterol By-Products

Sources of the most harmful cholesterol to monkey aortas are:



1. Custard mixes
2. Pancake mixes
3. Parmesan Cheese
3. Lard



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“Especially Harmful”

“Especially harmful are the custards and puddings in which milk, eggs, and sugar are the chief ingredients. The free use of milk and sugar together should be avoided.”



Ellen G White. The Ministry of Healing. Pg. 301.

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Role of antioxidants in generalized anxiety disorder and depression

- It was observed that patients with GAD and depression had significantly lower blood levels of antioxidants in comparison to healthy controls.
- After dietary supplementation of these vitamins for a period of 6 weeks, a significant reduction in anxiety and depression scores of patients was observed ($P < 0.001$).
- Indian J Psychiatry. 2012 Jul-Sep; 54(3): 244–247.

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The Power of Whole Plant Foods

- Exceeds that of their component parts
- One cup of cooked kale has 50mg of Vitamin C and 13 IU of Vitamin E
- The antioxidant potential of one cup of kale is equal to 800mg of Vitamin C and 1100 units of Vitamin E

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Antioxidant Rich Fruits

- 1 Blueberries
- 2 Blackberries
- 3 Strawberries
- 4 Raspberries
- 5 Plums
- 6 Oranges
- 7 Red grapes
- 8 Cherries
- 9 Kiwi fruit
- 10 Grapefruit, pink

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Antioxidant Rich Vegetables

- 1 Garlic
- 2 Kale
- 3 Spinach
- 4 Brussels sprouts
- 5 Broccoli Flowers
- 6 Beets
- 7 Red bell pepper
- 8 Onion
- 9 Corn
- 10 Eggplant

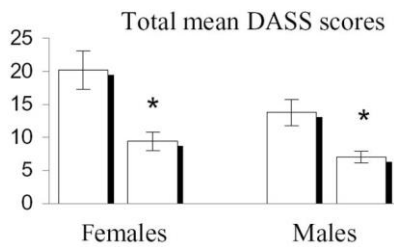


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- Article: Vegetarian diets are associated with healthy mood states
- Beezhold *et al. Nutrition Journal* 2010, 9:26

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Significantly better scores on the Depression, Anxiety and Stress scale.



* p=<.01

•Beezhold *et al. Nutrition Journal* 2010, 9:26

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Why were vegetarians significantly less depressed, anxious and stressed than even healthy meat eaters in the study?

- "Negligible arachidonic acid intake may help explain the favorable mood profile we observed with vegetarian diets."

•Beezhold *et al. Nutrition Journal* 2010, 9:26

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Omnivores ate 9 times as much arachidonic acid than the vegetarians, which is not surprising, given that arachidonic acid is not found in plants.

Table 2: Fatty acid intakes of participants by diet group

	OMN	VEG	P
	Mean ± SE	Mean ± SE	value
	g	g	*
Arachidonic	0.09 ± 0.01	0.01 ± 0.00	< 0.001

*Beezhold *et al. Nutrition Journal* 2010, 9:26

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Nutritional Causes of Lack of Mental Power

Low omega-3 fatty acid intake



Nature Medicine. 1997;4(7):25-30. The Lancet. 1997;349:915-919. Journal of Clinical Psychiatry. 1998;154(4):497-501. Am. J. Psychiatry. 1997;154:426-428. Nature. 1997;386:824-827

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Omega-3 Brain Benefits in Healthy Persons

- Improved frontal lobe function
- Improved sense of wellbeing
- Increased vigor and energy
- Improved reaction time
- Improved attention,
- Improved test scores
- Improved mood
- Better control of thoughts and behavior and less impulsivity

Fontani G, Corradeschi F, Felici A, et al. Cognitive and physiological effects of omega-3 polyunsaturated fatty acid supplementation in healthy subjects. Clin Invest 2005;35:691-699.

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Omega-3 Benefits in Mental Disease

- Decreases risk of at-risk young people becoming psychotic
- Helps prevent major depression/anxiety in women with psychological distress
- Decreases anger in men with aggressive behaviors and problems with the law
- Clinical response of over 50 percent in those with major depression and/or anxiety
- Improves bipolar disorder

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Additional Benefits of Omega-3

- Improves memory in those with middle age-related cognitive decline
- Improves aggression and depression in those with borderline personality disorder
- Lowers risk of dementia
- Can improve some aspects of ADHD
- Improves IQ in babies of mothers who breast feed and get adequate amounts in their diet.

Parris M. Kidd, PhD Omega-3 DHA and EPA for Cognition, Behavior, and Mood: Clinical Findings and Structural- Functional Synergies with Cell Membrane Phospholipids Alternative Medicine Review Volume 12, Number 3 2007

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Omega 3 Supplements Help Manic Depression

Patients receiving omega 3 supplements "had a significantly longer period of remission (from illness) than the placebo group." Patients receiving omega 3 supplements also displayed considerable improvement on tests assessing levels of depression and other bipolar symptoms.

In an editorial, Dr. Joseph Calabrese and colleagues at Case Western Reserve University in Cleveland, Ohio, call the trial a "landmark attempt in drug development for bipolar disorder."

Archives of General Psychiatry 1999;56:407-412, 413-414, 415-416

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How to Most People Get Their Omega-3?

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Fish High in Omega 3

Fish	Amount	Omega-3 (mg)
Drum fish	1 ea.	810
Tuna (in water)	1 serv.	930
Rainbow trout	1 ea.	1180
Freshwater bass	3.5 oz	1190
Pink Salmon	3.5 oz	1710
Herring	3.5 oz	3000
Halibut	3.5 oz	3160
Shad fillet	1 cup	3680
Atlantic mackerel	3.5 oz	3930

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Biomagnification of DDD Insecticide



Sample Site	DDD, ppm
Lake water	0.02
Phytoplankton (living in DDD-contaminated water)	5
Herbivorous fish (they eat the phytoplankton)	40-300
Carnivorous fish (they eat the herbivorous fish)	up to 2500

In parts per million (ppm) in Clear Lake, CA

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E.P.A Recommendations for Young Children, Pregnant and Nursing Women and Women who Could Get Pregnant (Adapted)

- Avoid all consumption of mercury-rich fish like shark, swordfish, king mackerel, and tilefish.
- Limit fish consumption to one average sized meal per week if you are eating local fish where no safety advisories are available. (If there are local warnings—heed those admonitions.)
- Even when fish are lower in mercury, limit intake to two average-sized meals per week. (The Environmental Protection Agency states that “nearly all fish and shellfish contain traces of mercury.”)
- United States Environmental Protection Agency and Food and Drug Administration. Consumption Advice: Joint Federal Advisory for Mercury in Fish. March 19, 2004. Accessed April 28, 2004 at <http://www.epa.gov/waterscience/fishadvice/advice.html>.

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Mercury and Fish

The connection between eating fish and body mercury levels is so strong that researchers seeking to determine mercury exposures among groups of people often look at only one dietary factor: fish consumption.

(1) Levy M, et al. Childhood urine mercury excretion: dental amalgam and fish consumption as exposure factors. Environ Res. 2004 Mar;94(3):283-90.
 (2) Bjornberg KA, et al. Methyl mercury and inorganic mercury in Swedish pregnant women and in cord blood: influence of fish consumption. Environ Health Perspect. 2003 Apr;111(4):637-41.

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Mercury Toxicity and the Brain

- Insomnia
- Nervousness
- Hallucinations
- Memory loss
- Headache
- Dizziness
- Anxiety
- Irritability
- Daytime Drowsiness
- Emotional instability
- Depression
- Poor cognitive function

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Other toxins that impair mental performance

- Polychlorinated biphenyls (PCBs)
- Dioxins
- Pesticides
 - DDT
 - Heptachlor
 - Dieldrin
- Lead
- Polychlorinated naphthalenes (PCNs)

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The idea is to get sufficient omega-3

Without cholesterol, mercury, and other toxins.

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Plant Foods Containing Omega-3 (Linolenic Acid)

Food Item	Amount	Omega-3 (mg)
Flaxseed/Linseed oil	1 Tbs.	7526
Chia Seeds	1 Tbs.	7289
Walnuts, English	¼ cup	1703
Walnuts, black	¼ cup	1034
Wheat germ oil	1 Tbs.	938
Soybean oil (Crisco/Wesson)	1 Tbs.	927
Green soybeans	1 cup	637
Spinach canned	1 cup	353
Almonds	¼ cup	136

ESHA Research 3rd Edition 2000

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Three Different Types of Omega-3

- ALA (Alpha linolenic acid)
 - Present in land plant sources
- EPA (Eicosapentaenoic acid)
 - Largest omega-3 in most fish but also present in water plants
- DHA (Docosahexaenoic Acid)
 - Also present in water plants and fish
- ALA turns into EPA which can turn into DHA
 - Requires Vitamin B-3, and Vitamin B-6, Magnesium, Zinc, and Vitamin C

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Plant based diets and DHA

- Lifelong plant based vegetarians still have DHA in their brain
- Their rates of conversion of ALA into EPA and then DHA in preliminary research seems to be better
- They can still eat water-plant sources or water plant DHA supplements
- Water-plant DHA supplements are the only type of supplemental DHA that has been shown to improve learning and memory

Karin Yurko-Mauroa, Deanna McCarthy, Dror Romb, Edward B. Nelsona, Alan S. Ryana, Andrew Blackwellc, Norman Salem Jr.a, Mary Stedmand, Volume 6, Issue 6, Pages 456-464 November 2010 Beneficial effects of docosahexaenoic acid on cognition in age-related cognitive decline

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Study presented at the Public Health Association conference 2012 by Bonnie L Beezhold, PhD, MHS

They took a group of meat eaters and split them in three groups

The control group maintained regular intake of flesh foods (CON)

Second group ate fish, but no other meat

The third was put on a vegetarian diet with no eggs

•Arch Oral Biol. 2005
Jan;50(1):1-6.

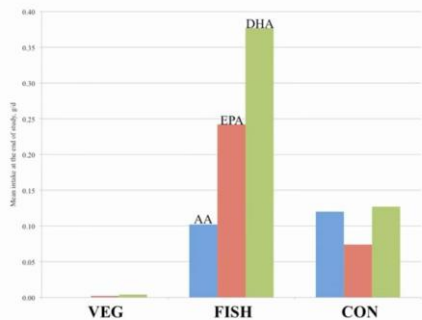
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- If it was primarily the saturated fat inflaming the omnivores' brain, then the moods of both the veg and fish groups would presumably improve.
- If arachidonic acid was the culprit then presumably only the veg group would feel significantly better.

•Arch Oral Biol. 2005
Jan;50(1):1-6.

48

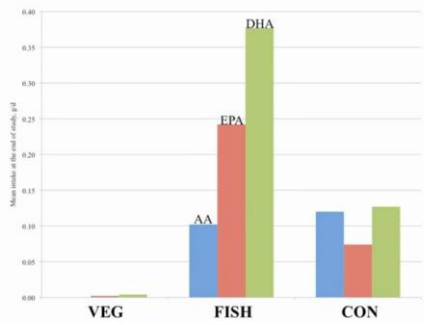
This is the amount of arachidonic acid in the blue consumed per day by the end of the study



•Arch Oral Biol. 2005

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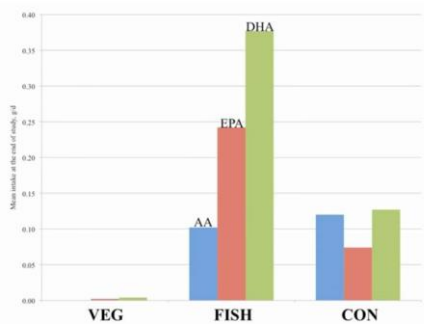
The fish eaters were eating a lot more of those long chain omega 3's, EPA and DHA so maybe they were protected even though they were consuming all that arachidonic acid in fish?



•Arch Oral Biol. 2005

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Or, maybe no one would experience a change in mood at all in such a short time frame-Just two weeks, sometimes it takes drugs months to have an effect

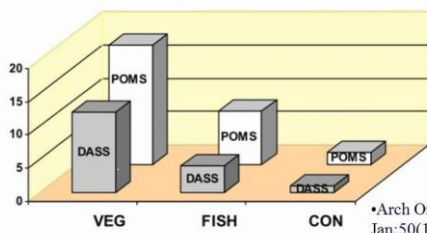


•Arch Oral Biol. 2005

51

After two weeks. Here is what they found, in terms of psychological benefits, the egg free vegetarian group significantly improved.

Comparison of mood score reductions by diet group

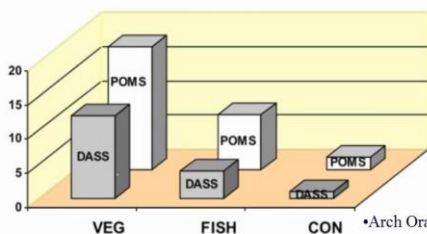


•Arch Oral Biol. 2005 Jan;50(1):1-6.

52

In two weeks, here is what they found, in terms of psychological benefits, the egg free vegetarian group significantly improved. Meaning greater reductions in both the Depression, Anxiety, Stress Scale and the Profile of Mood States a measurement of mood disturbance.

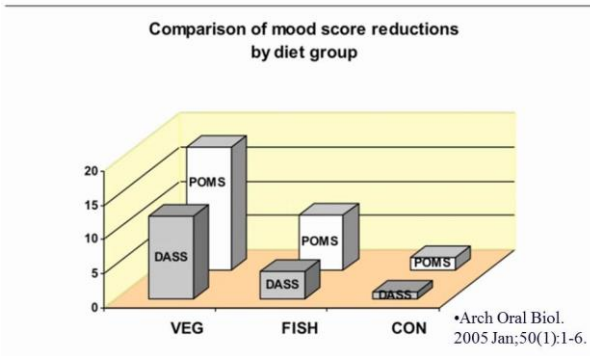
Comparison of mood score reductions by diet group



•Arch Oral Biol. 2005 Jan;50(1):1-6.

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Though the no-poultry fish group did marginally better than the control group, the difference was not statistically significant.



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Conclusion:

- “The complete restriction of flesh foods significantly reduced depression and anxiety in omnivores.

Arch Oral Biol. 2005 Jan;50(1):1-6.

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Four Step Weight Loss Plan

- No snacks. Drink only water between meals.
- Eat a good breakfast and a moderate lunch. Eliminate the evening meal.
- Eliminate or at least greatly reduce refined sugar and free fats or fatty foods in the diet, while emphasizing foods high in fiber.
- Daily moderate exercise for at least 60 minutes a day.



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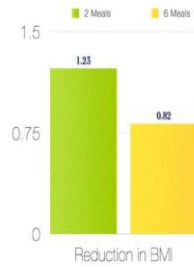
Lose weight by changing meal time

- 10 lb. per month on average lost by those who ate only breakfast
- 5-6 lb. per month on average lost for those that ate breakfast, lunch, and snacks.
- Those losing 20-30 lb. showed increase in hemoglobin levels
- Diabetics that lost 30 lb. had normalized blood sugar levels
- Hypothyroid patients showed a reduction in daily thyroid maintenance

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Impact of 2 meals vs 6 meals a day in 54 Healthy, Normal Weight Middle-Aged Men and Women

- Over 12 weeks people who ate just breakfast and lunch lost on average of 1.23 points on BMI
- Those who ate 6 smaller meals of same nutritional value and content only lost 0.82 on BMI



*Carlson O, Martin B, Stote KS, et al. Impact of reduced meal frequency without caloric restriction on glucose regulation in healthy, normal-weight middle-aged men and women. *Metab Clin Exp.* 2007;56(12):1729-34.

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- “Our results support the ancient proverb: ‘Eat breakfast like a king, lunch like a prince, and supper like a pauper.’ ”

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Mental Health Advantages to Eating a Balanced Breakfast

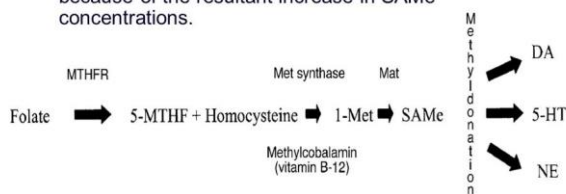
- Better cognitive performance
- Better scholastic scores (improved learning and memory)
- Improved creativity
- Link between skipping breakfast and depression in 5000 University students
- Breakfast eaters have a more positive mood, performed better on spatial orientation tests and felt calmer at the end of the testing.

Allgower A, *Health Psychology* 2001 and Smith AP, *Physiol Behav.* 1999.

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Folate and Vitamin B-12 Deficiency

- The common mediator of the effects of B-12 and folate deficiency may be reduced SAMe.
- Correction of folate and vitamin B-12 deficiencies may alleviate depressive symptoms and augment the response to antidepressant therapy, perhaps because of the resultant increase in SAMe concentrations.



Mischoulon & Fava. *AJCN* 2002 Nov;76(5):1158S-61S.

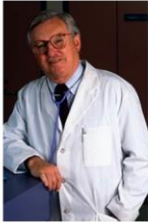
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If supplementing Vitamin B-12

- Use hydroxycobalimin
- The detoxifying Vitamin B-12

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Diderot's Proverb



"Doctors are always working to preserve our health and cooks to destroy it. But the latter are often the more successful."