



Fatty acids



ESSENTIALS

» Your guide to understanding healthy fats—and their role in optimal wellness



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Way back when, health-conscious people fled fat like it was evil incarnate, a contagious lipid version of Eve’s apple, lurking in foods, waiting to contaminate our bodies with a mere drop.

Today we know better.

Research has revealed the existence of several very different types of dietary fat. And while some, like trans-fats, are rather evil when it comes to our health, others are essential to it, particularly unsaturated fatty acids. Our bodies can synthesize some of the fats they need from what we eat. However, there are two crucial, “essential fats” that our bodies cannot make that must be consumed, omega-6 and omega-3. Omega-6 fatty acids come mainly from plant sources. Omega-3 fatty acids come from plant and most importantly, from marine sources.

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Types of essential fatty acids

Different types of essential fatty acids help us in different ways, and there's a required balance in order for them to function optimally. Take a look.

Omega-3 fatty acids

come in various forms that deliver distinct benefits

Docosahexaenoic acid (DHA)



is an unsaturated structural fat that is a key component of the brain, nervous system and eyes and is critical for vision, heart and cognitive health.

Eicosapentaenoic acid (EPA)



is another unsaturated fatty acid, which produces anti-inflammatory compounds and helps maintain normal levels of triglycerides.

Alpha-linolenic acid (ALA)



Our bodies can convert this type of fatty acid, present in plant sources, into EPA and DHA. The conversion rate isn't terrific, however. The body converts less than 10 percent of ALA to EPA and less than 5 percent to DHA, according to the *American Journal of Clinical Nutrition*.

Omega-6 fatty acids

also play a crucial role in brain function. They help stimulate skin and hair growth, maintain bone health, regulate metabolism and keep our reproductive systems running smoothly as well. The average diet provides sufficient omega-6 fatty acids, so supplementation is usually not necessary.

» All about that balance

Consuming the proper balance of omega-3 and omega-6 fatty acids is vital to our health. Most Americans get way too many omega-6s and not nearly enough omega-3s. The average American diet pushes the ratio to somewhere between 14:1 and 25:1, according to the University of Maryland Medical Center. Foods such as corn, safflower, sesame and sunflowers oils, animal meat, milk, and eggs are packed with omega-6 fatty acids. Omega-6s can counteract the benefits of omega-3s. In general, we should try to consume more omega-3s to balance the level of dietary omega-6s.



“According to the Global Organization for EPA and DHA Omega-3s (GOED), more than 28,000 studies have been published exploring the role of EPA and DHA on our health and new research continues to reveal benefits. “Omega-3s are the most studied nutrients in human history,” says Adam Ismail, Executive Director, GOED. Research from prestigious organizations like the National Institutes of Health, Harvard and Tufts all found evidence backing the health-promoting powers of omega-3s. “On average, in 82 percent of all randomized, controlled trials published in the last nine years, the authors have concluded that there is a benefit for omega-3 consumption,” said Ismail.

Why essential fatty acids are so important

A lack of essential fatty acids compromises our health at the very basic level, our cells. “The type of fat you consume determines the type of fatty acid found in the cell membranes. A diet that is high in cholesterol and consisting mostly of saturated fat and trans-fatty acids results in cell membranes that tend to be rigid and less permeable than those found in a person whose diet includes optimal levels of unsaturated fatty acids,” says Dennis Goodman, MD, Clinical Professor and the Director of Integrative Medicine at NYU and author of several articles and natural health books, including *The Thrill of Krill*, *What You Should Know About Krill Oil* (Square One Publishers, 2015). “Without the right type of fats, cell membranes lose their ability to hold water and vital nutrients. And without healthy membranes, cells simply cannot function properly.”

» TRIFECTA OF HEALTHY BENEFITS

While research suggests that essential fatty acids may help with everything from inflamed joints to diabetes, the most studied benefits involve our heart, brain and eyes.

 **HEART HEALTH:** Omegas support a healthy heart—that’s the upshot of more than 2,000 studies about the compounds and our cardiovascular system, according to the GOED. A seminal study published in *The American Journal of Clinical Nutrition* in 2008 demonstrated that people who ate just 250 mg combined EPA+DHA daily were 36 percent less likely to die of a heart attack than those who ate none. Important studies in the *New England Journal of Medicine* (2002) and the *Journal of the American Medical Association* also demonstrated the heart-protective qualities of omega-3s.

Since then, numerous studies have suggested that boosting EPA+DHA intake can improve heart health by preventing irregular heartbeats and blood clots, boosting



» **Omeegas may also help boost your mood. Studies suggest they help keep the “happy” neurotransmitters like dopamine and serotonin, flowing.**

vascular function, and decreasing plaque growth and inflammation in our arteries. Three big meta-analyses of research determined that omegas may reduce both systolic and diastolic blood pressure, a risk factor for heart disease. Taking the fatty acids made as much of a difference as lifestyle changes like increasing physical activity and limiting alcohol and salt.

Another key way omegas help our hearts is by lowering levels of blood triglycerides. High triglyceride levels may raise the risk of heart disease. In a study published in the American Journal of Clinical Nutrition (2011) researchers found that high doses of EPA and DHA omega-3s may lower triglyceride levels. This effect has been found in people with normal triglyceride levels and it's been found to work even more powerfully among people whose triglyceride levels are high.

Consuming healthy fatty acids is like putting fuel in the tanks of the system that keeps our heart working properly. A scientific paper published in PLOS Med (Public Library of Science) estimated that in 2005 between 72 and 96 thousand people – in the U.S. alone – died from cardiovascular events due to insufficient intake of omega-3s.



BRAIN: Much of our gray matter is made of fat, especially DHA. It's also a key component of specialized brain cells called neurons that transmit information to other nerves, muscles and gland cells. These cells need a steady source of omega-3s to keep them humming. Mounting evidence suggests that people who get more DHA throughout life are less likely to develop dementia; one paper in The American Journal of Clinical Nutrition concluded that 180 mg daily of DHA (roughly three servings of fish per week, which can also be achieved by taking an omega-3 supplement daily) reduced dementia risk by 50 percent. That doesn't mean you should wait until you start forgetting where you put your keys to begin paying attention to your omega-3 intake. Quite the opposite. DHA is critical for pregnant and nursing women, infants and children to help the brain develop properly.

Omeegas may also help boost your mood. Studies suggest they help keep the “happy” neurotransmitters like dopamine and serotonin, flowing. And, they may also help with cognitive conditions like attention deficit hyperactivity disorder (ADHD). One May 2014 review of 19 studies looking at people needing to address mood and emotional health who took EPA/DHA alone or alongside medication showed that those taking omega-3s felt significantly better than those taking a placebo. Another pilot study looked at ADHD patients, age 10 to 32, and found that the people who took 500 mg of krill oil daily showed a “significant improvement” on measures of self-control and executive function



EYES: The highest concentration of the fatty acid DHA is in our retinas. Omega-3s, particularly DHA, are critical in developing and maintaining healthy vision. Several studies suggest omega-3s may also help protect adult eyes from macular degeneration and dry eye syndrome. Essential fatty acids also may help proper drainage of intraocular fluid from the eye, decreasing the risk of high eye pressure and glaucoma.



The case for supplementing with omega-3 fatty acids

The American Heart Association recommends adults eat two fish servings each week. That would provide approximately 250-300 mg per day of DHA+EPA. They suggest that people with heart disease may consider daily intakes as high as 1,000 mg (1 gram) of EPA and DHA per day.

Most Americans are woefully deficient in omega-3 fatty acids. Women only get 40 percent of the omega-3s they need while men get just half the amount they should, according to the GOED.

While you can certainly get omega-3 fatty acids from your diet, to ensure you're giving your body all of the benefits of these compounds and getting enough, it's important to add an essential fatty acid supplement to your daily routine.

SUPPLEMENT SOURCES/CHART

With the diversity of supplements available to help you fuel and protect your body with the recommended daily dose of omega-3 fatty acids, it's easy to make certain you're getting enough of these "good" fats. And now there are a host of options available that cater to various dietary preferences and health needs.

MARINE: Omega-3 supplements can come from a variety of sources. When you choose a marine-sourced omega-3 supplement, be sure to check the label for certification from Friend of the Sea or the Marine Stewardship Council, two leading international non-profits that work to make sure marine species are caught sustainably.

Fish oil: Fish oil is the most well-known omega-3 supplement. It's been taken for health since the time of Hippocrates. Today's supplements are sourced from anchovy, sardines, menhaden, wild Alaskan salmon, farmed salmon, wild Pacific Pollock, wild Pacific whiting, cod and tuna. The fats in fish oil in supplements come in two forms, triglyceride (TG) and ethyl ester (EE). Both are similar in terms of absorption and benefits.

Krill oil: Another source for omega-3 supplements, krill are tiny, shrimplike crustaceans that feed on algae, accumulating EPA and DHA as they munch. Different from fish oil, the omega-3s in krill oil are attached to a phospholipid backbone more similar to human cell membranes—which makes krill oil easier to digest and absorb. Because omega-3 fatty acid phospholipids are both fat and water soluble, they don't pool on top of the stomach and create "fish burps" like some fish oil pills.

Note: Some studies suggest that omega-3s from krill are used more efficiently in the body than some other sources. One 2009 study indicated that when 48 people took 100 mg of EPA+DHA for 112 days, those getting it from krill oil saw their omega-3 Index (a measure of omega-3 fatty acid levels in red blood cells) jump 67 percent, 2.5 times as much as those getting it from other sources. Another study looked at 113 people over seven weeks and found that those taking krill oil providing 543 mg of omega-3 DHA and EPA achieved a comparable improvement in blood levels as those taking 864 mg of DHA+EPA from fish oil.

JENNIFER OLSON

CONTINUED... SUPPLEMENT SOURCES/CHART

PLANT: Alpha-linolenic acid is the primary omega-3 fat from plant-based sources, although you “cannot rely on ALA from food sources alone to provide an adequate amount” of EPA and DHA, says Clinical Professor Dennis Goodman, MD. Studies show vegetarians take in only about 5 mg EPA and 33 mg DHA daily, far short of what physicians and dietitians recommend.

Algae: Algae—where fish get their EPA and DHA—is a rising plant source for omega-3 fatty acids. Sustainably farmed, free of ocean contaminants, and vegan, algal oil supplements now offer DHA as well as EPA. Are they as effective as fish oil? Aside from dose, they provide DHA and EPA similarly to fish oils and krill oil, although generally not in phospholipid form.

Seeds and more: Other plant sources of omega-3 fatty acids include oil made from chia seeds, flax seeds, camelina (wild flax), black currants, black cumin, borage, evening primrose, safflower, pomegranate, pumpkin, and seabuckthorn seeds.





Get the right types of fats in your diet

“Most people know that eating fish is good for you, but they don’t really understand why,” says Marie Spano, RD, a leading sports nutritionist and a member of the Always Omega-3s Scientific Advisory Council to the GOED. “There’s a lot of confusion around omegas in general. Lots of people don’t realize you can get them from sources other than fish.”

Not all fish are great sources of omegas either. While fatty fish like salmon, sardines, mackerel, tuna, trout and anchovies are packed with the good stuff, swordfish, snapper and flounder only contain a trace of essential fatty acids. Try these delicious ways to include healthy fish in your diet.



Salmon with Mango-Avocado Relish

Ingredients

- 1 tablespoon lime juice (1 small or 1/2 large lime)
- 2 tablespoons plus 1 teaspoon canola oil
- Salt and freshly ground black pepper (to taste)
- 1 ripe mango, peeled and finely diced
- 3 tablespoons finely minced red onion
- 1 jalapeño pepper, seeded and finely minced
- 2 tablespoons minced fresh cilantro
- ½-1 avocado, roughly diced
- 4 6-ounce salmon fillets with skin, 1 to 1-¼ inch thick
- 1 pound spinach, washed and steamed

Directions:

1. In a medium glass bowl, whisk together lime juice and 2 tablespoons canola oil. Add salt and pepper to taste. Add mango, red onion, jalapeño and cilantro; toss to mix. Gently fold in avocado. Adjust seasonings and refrigerate until salmon is done.
2. Sprinkle salmon with salt and pepper. Place a heavy-bottomed 12-inch skillet over high heat for 3 minutes.
3. Add 1 teaspoon canola oil to the pan and swirl to coat. After 30 seconds, place salmon skin-side down in pan. Cook for 30 seconds, and then reduce heat to medium-high. Do not disturb fillets until the dull, opaque color has spread about halfway up the side of each fillet, about 4½ minutes. Turn fillets over and cook another 3½ minutes or until just opaque. Remove pan from heat; place fillets on a paper towel-lined plate and allow to rest for 45 seconds.
4. Serve on a bed of steamed spinach, with relish spooned on top.





» **Sardines will become a new favorite for anyone wanting to experiment in the kitchen with a flavor- and nutrient-packed fish**

Sardine Spread with Beet-Pickled Onions

Ingredients

2 cups natural cane sugar
1 tablespoon salt
2 cups apple cider vinegar
1 medium onion, thinly sliced
1 (7-ounce) beet, broiled or roasted, peeled, and diced small
½ pound meaty fish fillets, such as California yellowtail, mahi mahi, or opah
1 ½ tablespoons salt, divided
1 teaspoon ground black pepper, divided
2 tablespoons olive oil
1-2 whole Pacific sardines, scaled and gutted (or one 4.5-ounce can boneless, skinless sardines in water)
½ red bell pepper, roughly chopped
½ cup chopped fresh parsley
¼ cup chopped fresh dill
½ cup chopped fresh basil
Zest and juice of one lemon
½ tablespoon ground coriander
½ pound low-fat cream cheese (room temperature)
2 tablespoons unsalted butter (room temperature)

Directions

- 1. Make Beet-Pickled Onions:** In a medium pot, boil sugar and salt in vinegar, until dissolved. Add onion and beets. Simmer 1 minute. Cool several hours.
- 2. Season fish fillets** with ½ teaspoon salt and ½ teaspoon pepper. Heat olive oil in a sauté pan on medium heat; add fillets. Cook for 3 minutes; then flip. Add sardines to pan (omit this step if using canned sardines). Cook for 1 minute; then flip sardines. Cover and cook 2 more minutes.
- 3. Remove skin from fillets** and transfer fish to a large food processor; pulse for 1 minute. Peel sardines away from spines and add to processor (if using canned, drain and add to processor). Process until shredded. Add remaining salt and pepper, plus bell pepper, parsley, dill, basil, lemon zest and juice, and coriander. Process 1 minute more.
- 4. With food processor running,** add cream cheese and butter a little at a time. Process until incorporated. Salt and pepper to taste. Spread in a shallow dish and refrigerate. Top with drained beet-pickled onions to serve.

» 3 WAYS TO COOK SARDINES

These little fish rank high among overlooked health foods. A member of the herring family, sardines are chock-full of heart-healthy omega-3 fatty acids and vitamin B12; canned sardines' soft, edible bones provide vitamin D and calcium, too. They're also an economical and sustainable seafood pick. Purchase canned sardines in water, olive oil, or flavored with herbs, tomatoes, mustard, or other enhancements.

Pizza. For an anchovy alternative, layer sliced or whole canned, drained sardines atop a pizza crust with marinara sauce, slivered garlic, chopped red onion, capers and red pepper flakes. Bake until heated through.

Appetizer. Heat canned diced tomatoes with drained and chopped sardines, some of the sardines' flavored oil, minced garlic, Italian herbs, a dash of balsamic vinegar and a squeeze of lemon. Mound on toasted baguette slices and sprinkle with parsley or shaved fennel.

Sandwich. Mix drained, flaked sardines with finely chopped red onion and Dijon mustard. Spread on bread and broil until hot; top with sliced avocado or tomato.



Roasted Rainbow Trout with Rosemary, Spinach and Pine Nuts

Ingredients

2 large bunches spinach, stems removed (12 ounces)
4 whole trout, heads and tails removed (about 5 ounces each)
1½ tablespoons plus 1 teaspoon olive oil, divided
8 2-inch pieces rosemary sprigs
4 cloves garlic, thinly sliced
2 tablespoons pine nuts
¼ cup currants or raisins
4 teaspoons fresh lemon juice
1 teaspoon minced fresh rosemary

Directions

1. Preheat oven to 425°. Wash, dry, and trim spinach. Set aside.
2. Coat a baking sheet with parchment paper. Open each trout like a book. Drizzle each with ¼ teaspoon olive oil, then season to taste with salt and pepper. Place 2 rosemary sprigs on one side of each trout; fold fish in half. Arrange trout on baking sheet. Roast on middle oven rack 13–16 minutes, until thickest part of fish is opaque and flaky.
3. While trout roasts, heat a large saucepan over low-medium heat. Add remaining 1½ tablespoons olive oil, then garlic and pine nuts. Cook and stir until garlic is pale gold, about 2 minutes, then add a third of the spinach to the pan. Sprinkle currants or raisins over the spinach. Gently turn the spinach with tongs until most of it is wilted. Gradually add remaining spinach, a handful at a time, turning and cooking until all the spinach is wilted. Season to taste with salt and pepper.
4. Open trout fillets, discard rosemary sprigs, and then arrange trout on dinner plates. Drizzle with lemon juice, and then sprinkle with minced rosemary. Mound spinach next to fish and serve.





Flaxseed and Pomegranate Smoothie

Ingredients

1 tablespoon whole flaxseed
 1 cup frozen peaches
 ½ cup frozen strawberries
 ½ cup pomegranate juice
 ½ cup plain, low-fat yogurt
 Sweetener, to taste

Directions:

1. Pulse flaxseed in a spice grinder or coffee mill until finely ground (this is because the seeds are not digestible and they must be ground for your body to get the nutrients from them). Place peaches, strawberries, juice and yogurt in a blender. Add ground flaxseed and blend until smooth. Sweeten if desired.



Chocolate-Coconut Chia Pudding

Ingredients:

6 medjool dates (pitted)
 ½ cup hot water (for soaking dates)
 7 ounces coconut milk
 1½ tablespoons unsweetened cocoa powder
 1 dash salt
 ½ cup chia seeds
 2 cups unsweetened almond milk

Directions:

1. Soak dates in ½ cup hot water for 15 minutes.
 2. In a blender, combine dates, soaking liquid, coconut milk, unsweetened cocoa powder and salt; blend until smooth.
 3. Transfer to a bowl and add chia seeds and almond milk; whisk to blend. Cover and refrigerate 8 hours or overnight, whisking once or twice.



» PLANT-BASED FOOD SOURCES

You don't need to eat fish, however, to get your omegas. "There are plenty of vegetarian options," says Spano. Flaxseed is an essential fatty acid superstar, packed with omega-3s. Mild-tasting, it's an easy addition to lots of foods you may already be enjoying. Sprinkle it on salads, stir it into mustard or add it to your baking for an easy omega fix. Chia and hemp seeds are other sprinkle-able options for adding omegas. Dark leafy greens like kale and spinach have relatively high fatty acid content. Drizzle them with olive or flaxseed oil and you'll get even more. Walnuts, soybeans and tofu are good sources of ALA. Remember, though, that the body converts less than 10 percent of ALA to EPA and less than one percent to DHA.



Walnut Brownie Energy Bites

Ingredients:

- 1 cup raw almond meal
- ½ cup cacao powder
- ⅛ teaspoon sea salt
- ½ cup pitted Medjool dates (packed)
- 2 tablespoons honey
- ¼ cup raw walnuts (crushed)

Directions:

1. Place almond meal, cacao powder and salt in a large mixing bowl. Mix well. Add dates and honey, and mix well. Add crushed walnuts and mix.
2. Line a loaf or square pan with parchment paper or plastic wrap. Press mixture into bottom of pan. Enjoy immediately, or chill for a firmer texture.



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ABOUT NEPTUNE:

Since 1998, Neptune has been committed to delivering high-quality ingredients to the nutrition industry. In 2003, it delivered a novel source of omega-3 phospholipids by pioneering the krill oil industry with its flagship product, Neptune Krill Oil (NKO®). Today, Neptune also offers a range of marine oils, seed oils and other key nutritional ingredients.

Beyond its ingredient offerings, Neptune also provides custom formulations to branded marketers. Its unique offerings include fatty acids and other essential nutritional ingredients used in specialty formulations. Neptune develops and distributes these solutions as turnkey, ready-for-sale finished supplements in softgels, capsules and liquid delivery formats.

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