Salmon with Rosemary and Lemon

What’s one of the best food sources of vitamin D? Salmon of course!!! This salmon dish is very simple to make and it tastes absolutely amazing. This a great recipe to try on a busy weeknight when you don’t have a lot of time to make dinner but you want to ensure that you and your family obtain a substantial amount of your daily vitamin D requirement (among many other beneficial nutrients). Serve over couscous or rice, with a side of veggies such as green beans, asparagus or carrots.

makes 4 servings

Ingredients

• 4 salmon fillets (4oz each)
• 2 tsp salt
• 1 tsp ground pepper
• 1 tsp chopped fresh (or dried) rosemary leaves
• 1 lemon, thinly sliced
• 1/4 cup extra-virgin olive oil
• 1/2 small red onion, thinly sliced
• 8 garlic cloves, thinly sliced
• Tin foil

Directions

• Preheat oven to 425° F
• Place salmon fillets on foil (cut enough foil to completely cover fish once folded)
• Sprinkle salmon with salt, pepper and rosemary
• Place lemon slices, sliced onion and garlic over fillets
• Drizzle fillet evenly with olive oil
• Fold foil and crimp to make an air-tight package
• Bake for 20-25 minutes (depending on thickness of fillets)

Nutritional Information

per serving
Energy: 342 kcal
Total fat: 25.8 g
Saturated fat: 4.4 g
Omega 3’s: 2.3 g
Protein: 22.5 g
Carbohydrates: 3 g
Cholesterol: 67 mg
Sodium: 67 mg
Vitamin D: 411 IU
Vitamin D

Why is this vitamin so important?

Vitamin D is necessary for calcium absorption in the gut, thereby making it essential for proper bone growth and remodeling; and for maintaining normal bone mineralization. Without sufficient vitamin D, bones can become thin, brittle, or misshapen; and therefore, vitamin D, along with calcium, helps to protect older adults from osteoporosis.

In addition to its positive effects on bone health, vitamin D plays several other important roles in our bodies. For example, vitamin D is involved in immune function and can help reduce inflammation in the body. Furthermore, hundreds of studies have linked vitamin D deficiency with higher rates of many conditions and diseases, including several forms of cancer, heart disease and multiple sclerosis.

How much vitamin D do you need?

Recommendations for vitamin D intake vary. Current recommendations from Health Canada are 200 IU for people aged 0-50 years, 400 IU for people aged 51-70 years, and 600 IU per day for people over the age of 70 (see side note), but the Canadian Cancer Society now recommends 1,000 IU per day for all Canadians.

The daily vitamin D requirement is expressed in terms of an 'Adequate Intake' (AI) level, which represents a daily intake that is sufficient to maintain bone health and normal calcium metabolism in healthy people. Health Canada urges Canadians to meet their vitamin D needs through adequate intake of milk and alternatives that are vitamin D fortified. To find out if your intake of vitamin D is adequate, consult a Registered Dietitian. You can also have your physician administer a calcidiol test (also know as a 25-hyrdoxyvitamin D test) to measure your vitamin D blood levels, which may be more important than your daily intake of vitamin D.

How many forms of vitamin D are there?

Vitamin D obtained from sun exposure, food, and supplements is biologically inactive and must undergo a series of reactions in the body for activation. The first occurs in the liver and converts vitamin D to 25-hydroxyvitamin D [25(OH)D], also known as calcidiol. The second occurs primarily in the kidney and forms the physiologically active 1,25-dihydroxyvitamin D [1,25(OH)₂D], also known as calcitriol.
**How can we get vitamin D through our diet?**

Vitamin D is naturally present in very few foods. Fatty fish, such as salmon, tuna, and mackerel, and fish liver oils are among the best sources. Small amounts of vitamin D are found in beef liver, cheese, and egg yolks. Vitamin D in these foods is primarily in the form of vitamin D$_3$ (cholecalciferol) and its metabolite 25(OH)D$_3$. Fortified foods provide most of the vitamin D in the North American diet. For example, almost all brands of milk are fortified with 100 IU/cup of vitamin D (25% of the Daily Value). Ready-to-eat breakfast cereals often contain added vitamin D, as do some brands of orange juice, yogurt, and margarine. See the table below for the amounts of vitamin D found in some common foods.

<table>
<thead>
<tr>
<th>FOOD</th>
<th>IU’s per serving</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cod liver oil, 1 tablespoon</td>
<td>1,360</td>
<td>340</td>
</tr>
<tr>
<td>Salmon, cooked, 3.5 ounces</td>
<td>360</td>
<td>90</td>
</tr>
<tr>
<td>Mackerel, cooked, 3.5 ounces</td>
<td>345</td>
<td>90</td>
</tr>
<tr>
<td>Tuna fish, canned in oil, 3 ounces</td>
<td>200</td>
<td>50</td>
</tr>
<tr>
<td>Sardines, canned in oil, 1.75 ounces</td>
<td>250</td>
<td>70</td>
</tr>
<tr>
<td>Milk, nonfat, reduced fat, and whole, vitamin D-fortified, 1 cup</td>
<td>98</td>
<td>25</td>
</tr>
<tr>
<td>Margarine, fortified, 1 tablespoon</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>Ready-to-eat cereal, fortified with 10% of the DV for vitamin D, 0.75-1 cup</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Egg, 1 whole (vitamin D is found in yolk)</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Liver, beef, cooked, 3.5 ounces</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Cheese, Swiss, 1 ounce</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

**How do we obtain vitamin D from the sun?**

Ultraviolet (UV) B rays from the sun penetrate uncovered skin and convert 7-dehydrocholesterol (made from cholesterol) to pre-vitamin D$_3$, which in turn becomes calcitriol (active vitamin D) through the reactions that take place in our liver and kidneys. Season, geographic latitude, time of day, cloud cover, smog, skin pigment, and sunscreen are among the factors that affect UV radiation exposure and vitamin D synthesis. Despite the important role that the sun plays in vitamin D synthesis, it is best to limit our exposure to sunlight as UV radiation is a carcinogen and causes most cases of skin cancers in Canada and the U.S.

Are you interested in knowing how the above factors are affecting your individual ability to synthesise vitamin D from the sun? Check out the vitamin D/UV calculator at nutritiondata.com. Click on the ‘Nutrition Data Blog’ by Monica Reinagel and look up her post called ‘How much sunshine does it take to make enough vitamin D?’ from August 10, 2009. Here you can learn more about the factors affecting vitamin D synthesis and you can go to the link that takes you to the vitamin D/UV calculator, which estimates how many minutes of sun exposure you need for your skin to produce sufficient vitamin D.
What are the consequences of vitamin D deficiency?

Vitamin D deficiency is quite common—especially among kids, the elderly, and those with dark skin; and a growing list of diseases and conditions have been linked with vitamin D deficiency. In children, vitamin D deficiency causes rickets, a disease characterized by a failure of bone tissue to properly mineralize, resulting in skeletal deformities and soft bones. In adults, vitamin D deficiency can lead to osteomalacia, resulting in weak muscles and bones. Below are some examples of groups of people who are at risk of vitamin D deficiency:

- **Breastfed infants**— Vitamin D requirements cannot be met by human milk alone. It is recommended that breastfed infants be supplemented with 400 IU of vitamin D per day.
- **Older adults**— People aged 50 and older are at increased risk of becoming vitamin D-deficient. As people age, the skin cannot synthesize vitamin D as efficiently and the kidney is less able to convert vitamin D to its active form.
- **People with limited sun exposure**— Homebound individuals, people living in northern latitudes, women who wear long robes and head coverings for religious reasons, and people with occupations that prevent sun exposure have an increased risk of vitamin D deficiency.
- **People with dark skin**— Greater amounts of the pigment melanin result in darker skin and reduce the skin's ability to produce vitamin D from UV rays.
- **People with fat malabsorption and people who are obese**— As a fat-soluble vitamin, vitamin D requires some dietary fat in the gut for absorption. People who have difficulty absorbing fat will have a reduced capacity to absorb vitamin D. Furthermore, individuals with a body mass index (BMI) ≥30 typically have low blood concentrations of vitamin D.

What about vitamin D supplements?

For many people, consuming vitamin D-fortified foods and being exposed to sunlight are essential for maintaining a healthy vitamin D status. For individuals who fall into the ‘at-risk’ categories described above, dietary supplements may be required in order for them to meet their daily vitamin D requirements. In supplements and fortified foods, vitamin D is available in two forms: \( \text{D}_2 \) (ergocalciferol) and \( \text{D}_3 \) (cholecalciferol). Experimental evidence suggests that they are metabolized differently. Vitamin \( \text{D}_3 \) may be more than three times as effective as vitamin \( \text{D}_2 \) at raising blood concentrations of active vitamin D and at maintaining those levels for a longer period of time. Due to these findings, many supplements are being reformulated to contain vitamin \( \text{D}_3 \) instead of vitamin \( \text{D}_2 \). Both forms (as well as the vitamin D found in foods and that which is formed by UV rays in our skin) are effective at raising the concentrations of active vitamin D in our blood.

Sources