Nitrate and nitrite are naturally-occurring molecules that are everywhere in our environment. Green leafy vegetables, beets and radishes contain the highest levels of nitrate. The nitrate in vegetables, cheese, cured meats, and even our drinking water, is naturally converted into nitrite and nitric oxide in our bodies.

According to health experts and many research studies, nitrite and nitric oxide are essential for a healthy metabolism as they:

- Signal arteries to relax and expand
- Decrease blood pressure
- Protect against heart attack and stroke
- Signal immune cells to kill bacteria and cancer cells
- Signal brain cells to communicate with each other
- Reduce asthma symptoms
- Support cancer treatment
- Regulate insulin signaling and secretion
How do our bodies get Nitrate, Nitrite and Nitric Oxide?

Vegetables such as beets, celery, lettuce, radishes and spinach contribute about 85-90% of our dietary intake of nitrate. In our mouths, good bacteria react with nitrate to produce nitrite and provide approximately 50% of the body’s nitric oxide. The highest levels of nitrite are found in colostrum - the breast milk produced immediately after birth. This is nature’s way of supplementing the production of essential nitric oxide to keep babies healthy.

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Nitrate (mg/100g)</th>
<th>Nitrite (mg/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinach</td>
<td>741.0</td>
<td>0.02</td>
</tr>
<tr>
<td>Mustard greens</td>
<td>116.0</td>
<td>0.003</td>
</tr>
<tr>
<td>Salad mix</td>
<td>82.1</td>
<td>0.13</td>
</tr>
<tr>
<td>Cole slaw</td>
<td>55.9</td>
<td>0.07</td>
</tr>
<tr>
<td>Broccoli</td>
<td>39.5</td>
<td>0.07</td>
</tr>
<tr>
<td>Tomato</td>
<td>39.2</td>
<td>0.03</td>
</tr>
<tr>
<td>Carrots</td>
<td>0.1</td>
<td>0.006</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Nitrate (mg/100g)</th>
<th>Nitrite (mg/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>4.5</td>
<td>0.009</td>
</tr>
<tr>
<td>Fruit mix</td>
<td>0.9</td>
<td>0.08</td>
</tr>
<tr>
<td>Orange</td>
<td>0.8</td>
<td>0.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Meats/prepared meats</th>
<th>Nitrate (mg/100g)</th>
<th>Nitrite (mg/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot dog</td>
<td>9.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Bacon</td>
<td>5.5</td>
<td>0.38</td>
</tr>
<tr>
<td>Pork tenderloin</td>
<td>3.3</td>
<td>0.07</td>
</tr>
<tr>
<td>Ham</td>
<td>0.90</td>
<td>0.89</td>
</tr>
</tbody>
</table>

*1 The Nitric Oxide (NO) Solution: How to Boost the Body’s Miracle Molecule to Prevent and Reverse Chronic Disease by Nathan S. Bryan, PhD and Janet Zand, OMD with Bill Gottlieb. Published in 2010 by Neogenis.

Nitrate and Nitrite in cured meats.

To safeguard Canadians, Health Canada requires that nitrate and nitrite be used in all cured meats to protect against the growth of harmful spore-forming bacteria such as Clostridium botulinum. Nitrite can be added to meat products in two ways: either through sodium nitrite, which is synthetically produced, or through a natural source like cultured celery extract. Either way, they provide the same important food safety benefits.

In the United States, nitrate and nitrite from cured meats as a percentage of total dietary intake is estimated to be at less than 10%. The average daily intake of nitrate and nitrite by Canadians are at the lower end of the range of estimates by the World Health Organization.

Cured meats can be part of a healthy balanced diet. They are an important convenient source of protein, iron and minerals.
Nitrate-Nitrite-Nitric Oxide Pathway

A Nitrate and nitrite from food

B Bacteria in the oral cavity reduce nitrate to nitrite

C In the gastric acidic milieu, a non enzymatic reduction of nitrite to nitric oxide occurs

D Nitrate and remaining nitrite is absorbed in the intestine

E Nitrate and nitrite in blood originate from the food and form systemic nitric oxide production

F An active uptake of nitrate from the blood occurs in the salivary glands

G Nitrate is excreted by the kidneys

For Further Reading:

Nitrite and Nitrate in Human Health and Disease by Nathan S. Bryan and Joseph Loscalzo, Editors. Published in 2011 by Humana Press.

The Nitric Oxide (NO) Solution: How to Boost the Body’s Miracle Molecule to Prevent and Reverse Chronic Disease by Nathan S. Bryan, PhD and Janet Zand, OMD with Bill Gottlieb. Published in 2010 by Neogenis.


Nitrate and Nitrite – What Consumers Should Know

► What are nitrate and nitrite?
Nitrite (NO2-) and nitrate (NO3-) are two molecules that create nitric oxide in the body, which is essential to a healthy metabolism and good cardiovascular health.

► What foods contain nitrate or nitrite?
Many foods. Leafy green and root vegetables contain the highest levels of nitrate, while cured meats represent about 10% of our total dietary intake.

► Do our bodies need nitrate and nitrite?
Yes – they are important to the formation of nitric oxide, which is essential to good cardiovascular health, and have many other health benefits. Approximately 50% of nitric oxide in our bodies comes from the food we eat, and the other half is actually produced by our bodies as part of our normal metabolism.

► Why are they added to cured meats?
Nitrate and nitrite have been used as a food preservative for thousands of years. They act as an antioxidant in meat to keep fat from breaking down causing poor flavour and to inhibit the ability of spoilage bacteria and pathogens, such as Clostridium botulinum to grow.

► Do ‘natural’ meat products contain nitrate?
They do if they contain certain vegetable-based ingredients, such as cultured celery extract, which are sources of naturally-occurring nitrate and nitrite. Cultured celery extract is cultured to produce nitrite through a process similar to adding bacterial culture to milk to produce yogurt. In combination with vinegar, lemon juice and sea salt, cultured celery extract is a natural preservative that plays an important role in food safety.

► What is Health Canada’s position on nitrate and nitrite?
Nitrate and nitrite are approved in Canada and around the world as a safe and essential preservative. Health Canada requires their use in cured meats to protect food safety.

For more information on the allowable input level of nitrate and nitrite in cured meats, please refer to Health Canada’s Food and Drugs Regulations or the Canadian Food Inspection Agency’s web site and search for the Meat Hygiene Manual of Procedures.

► Is nitrite associated with cancer?
Numerous scientific panels have evaluated sodium nitrite safety and the conclusions have essentially been the same: nitrite is not only safe, it is an essential public health tool because it has a proven track record of preventing botulism.

Specifically, the National Toxicology Program, an agency within the United States Department of Health and Human Services and the world’s leading authority on the toxicological safety of chemicals, conducted a multi-year study to evaluate nitrite’s safety. The study, approved by a panel of experts in May 18, 2000, found that nitrite was safe at the levels used.

To inhibit the formation of nitrosamines, which are potentially harmful, Vitamin C and other antioxidants are added to all cured meat products. This is a highly effective method and is substantiated by more than 30 years of experience and public health monitoring and regulatory oversight.

Your opinion is important to us. If you have questions or comments, please call us at 1-800-268-3708 or email us through our website at www.MapleLeafFoods.com/contact-us.

For more information about nitrate and nitrite, please visit Maple Leaf’s Food Safety page at www.MapleLeafFoods.com.