ANTIOXIDANTS
Oxidation Inhibitor, Antioxidant Agents

A molecules that inhibits the oxidation of other molecules.

About Antioxidants

When free radicals (oxidants) are produced, they start chain reactions with cellular components such as DNA (deoxyribonucleic acid) or cell membrane that can cause a variety of cellular dysfunction. Free radicals have been implicated in many chronic diseases; such as cancer, cardiovascular, neurodegenerative and in aging. Normally, the body has mechanisms that can combat the adverse effects of free radicals and reduce the magnitude of damage they can produce. Such defense mechanisms involve what are known as antioxidants.

Also referred to as antioxidant agents, antioxidants can be defined as nutrients which often try to decrease the harmful effects of the free radicals on a person’s body cells. Our body cells normally require oxygen for energy and growth. The body cells make use of oxygen to effectively generate energy and sustain life, and release free radicals as by-products. The deeper, brighter colored vegetables and fruits contain higher concentrations of minerals, antioxidants and vitamins. Vitamin E and C are the body’s two primary antioxidants.

Even with normal amount of free radicals in our bodies, antioxidants help us to keep the number in a healthy range. A variety of vegetables, fruits, nuts, legumes and whole grain cereals, tea, herbs and red wine are some of the richest sources of antioxidants (Tab. 1). The benefit of eating vegetables, whole grain food and fruits is that they all contain natural antioxidants.

If you can eat a diet of antioxidants rich foods, some of the health problems you may be able to reduce the risk of include:

- cancer,
- heart disease,
- immune dysfunction,
- macular degeneration (is a deterioration or breakdown of the eye's macula),
- Alzheimer’s,
- infertility.

Antioxidants can be categorized into two types:

1. **Non-enzymatic antioxidants** work by interrupting free radical chain reactions. Non-enzymatic antioxidants include vitamin C, vitamin E, plant polyphenols, carotenoids and glutathione (GSH). Glutathione has been called the “master antioxidant” and is found in every single cell of your body, maximizing the activity of all the other antioxidants.

Most antioxidants found in foods and supplements are of the non-enzymatic type. They boost your enzymatic antioxidant defense system by doing a "first sweep," disarming the free radicals, which helps prevent depletion of your enzymatic antioxidants.

2. **Enzymatic antioxidants** work by breaking down and removing free radicals. Enzymatic antioxidants are produced in your body, can not be supplemented orally.

Examples of antioxidants that can affect infertility treatment:
Vitamin E helps counter oxidative stress, which is associated with sperm DNA damage and reduced sperm motility. A hormone-antioxidant combination may improve sperm count and motility. Oral antioxidants given to males in couples undergoing in vitro fertilisation for male factor or unexplained subfertility result in significantly higher live birth rate.

Selenium, an essential micronutrient and a free radical-scavenger, works synergistically with Vitamin E to protect spermatozoa from the effects of oxidation and to improve motility, morphology and pregnancy rates.

Folate is required for the synthesis of DNA, transfer RNA, cysteine, and methionine, which are required during periods of rapid cell growth. Given the peri-conceptional period is a time of cellular growth, it was postulated that folate supplementation may improve reproductive outcomes.

Vitamin C and β-carotene may be associated with slight improvements in semen parameters. Vitamin D improves the rate of low sperm motility.

Coenzyme Q10 therapy in male infertility show that oral supplementation with coenzyme Q10 increased seminal coenzyme Q10 levels, spermatozoa concentration and motility.

Oxidative stress (OS)
Oxidative stress (OS), a state characterized by an imbalance between pro-oxidant molecules including reactive oxygen and nitrogen species, and antioxidant defenses, has been identified to play a key role in the pathogenesis of subfertility in both males and females. The adverse effects of OS on sperm quality and functions have been well documented. In females, on the other hand, the impact of OS on oocytes and reproductive functions remains unclear. This imbalance between pro-oxidants and antioxidants can lead to a number of reproductive diseases such as endometriosis, polycystic ovary syndrome (PCOS), and unexplained infertility. Pregnancy complications such as spontaneous abortion, recurrent pregnancy loss, and preeclampsia, can also develop in response to OS.

Success or failure factors
A combination of numerous antioxidants has greater health benefits than when an antioxidant is eaten individually.

Even though antioxidants supplements are considered safe, several studies have suggested that taking a higher dose than the one recommended can be very harmful and possibly toxic.

Complications
Some antioxidant supplements may promote disease and increase mortality in humans under certain conditions. Hypothetically, free radicals induce an endogenous response that protects against exogenous radicals (and possibly other toxic compounds). Free radicals may increase life span. This increase may be prevented by antioxidants.

Relatively strong reducing acids can have affect the overall nutritional value of all foodstuff consumed by binding to dietary minerals such as iron and zinc in the gastrointestinal tract and preventing them from being absorbed. Notable examples are oxalic acid, tannins and phytic acid, which are high in plant-based diets. Calcium and iron deficiencies are not uncommon in diets in developing countries where less meat is eaten and there is high consumption of phytic acid from beans and unleavened whole grain bread.

Nonpolar antioxidants such as eugenol - a major component of oil of cloves - have toxicity limits that can be exceeded with the misuse of undiluted essential oils. Toxicity associated with high doses of water-soluble antioxidants such as ascorbic acid are less of a concern, as these compounds can be excreted rapidly in urine. More seriously, very high doses of some antioxidants may have harmful long-term effects. The beta-carotene and Retinol Efficacy Trial (CARET) study of lung cancer patients found that smokers given supplements
containing beta-carotene and vitamin A had increased rates of lung cancer. Subsequent studies confirmed these adverse effects.

These harmful effects may also be seen in non-smokers, as a recent meta-analysis including data from approximately 230,000 patients showed that β-carotene, vitamin A or vitamin E supplementation is associated with increased mortality but saw no significant effect from vitamin C.

Nutritional guidelines and recommendations are to be followed for preservation of health, while taking into account expert views.

### Prognosis

Antioxidants, in fact, might be responsible of subtle effects specific for human health optimization and/or disease prevention, which are processes that can be very different in many aspects from disease onset and progression.

In vitro and in vivo studies imply that antioxidant nutrients and related bioactive compounds from fruits and vegetables can protect us from oxidative stress. On the other hand, the presented evidence implies that synthetic antioxidant supplements cannot offer appropriate or total protection against oxidative stress and damage in "normal" situations and that the use of antioxidants to prevent disease or aging is controversial in situations of “normal” oxidative stress.

Prophylactic oral antioxidant therapy and supplementation of medium for culture, incubation/handling and cryopreservation can possibly help improve gamete quality and fortify the developing embryo. However, the appropriate antioxidants and dosages (whether as a sole compound or as a combination) suitable for different forms of infertility issues still remain an ongoing area of research.

In conclusion, the correct use of antioxidants may be useful to prevent free radical-related disorders. However, the repair of existing critical structural damage may be beyond the possibilities of antioxidants and therefore they may not be considered to be useful in therapeutic clinical applications, where their limits and eventual side effects must be better understood.

### Find more about related issues

#### Diagnoses

**Idiopathic male infertility**

A condition in which fertility impairment occurs spontaneously or due to an unknown cause.

Learn more at: [www.fertilypedia.org/therapy/diag/Idiopathic-male-infertility](http://www.fertilypedia.org/therapy/diag/Idiopathic-male-infertility)
<table>
<thead>
<tr>
<th>Rank</th>
<th>Food</th>
<th>Serving Size</th>
<th>Total Antioxidant Capacity per serving size</th>
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<tbody>
<tr>
<td>1</td>
<td>Small Red Bean</td>
<td>1/2 cup</td>
<td>17727</td>
</tr>
<tr>
<td>2</td>
<td>Wild blueberry</td>
<td>1 cup</td>
<td>13427</td>
</tr>
<tr>
<td>3</td>
<td>Red kidney bean</td>
<td>1/2 cup</td>
<td>13299</td>
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<tr>
<td>4</td>
<td>Pea bean</td>
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<td>5</td>
<td>Blueberry</td>
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<td>9015</td>
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<td>6</td>
<td>Cranberry</td>
<td>1 cup</td>
<td>8988</td>
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<tr>
<td>7</td>
<td>Arugula</td>
<td>1 cup</td>
<td>7954</td>
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<tr>
<td>8</td>
<td>Blackberry</td>
<td>1 cup</td>
<td>7701</td>
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<tr>
<td>9</td>
<td>Prune</td>
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<tr>
<td>10</td>
<td>Raspberry</td>
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<td>11</td>
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<tr>
<td>12</td>
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<td>13</td>
<td>Granny Smith</td>
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<tr>
<td>14</td>
<td>Bacon</td>
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<td>15</td>
<td>Sweet cherry</td>
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<td>Blue plum</td>
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<tr>
<td>20</td>
<td>Gala apple</td>
<td>1</td>
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Sources


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