Is Resveratrol the Missing Fountain of Youth?

Zoe Diana Draelos, MD

Man has been searching for the fountain of youth since the beginning of time. Wars have been waged over life-prolongation technology and this issue still captivates us in 2011. Vitamins that are guaranteed to restore vitality and increase health abound. Creams that improve wrinkles are hocked every day on cable television. In short, man is obsessed with living longer. In ancient times, the Egyptian pharaohs were specially embalmed and buried with their servants, animals, and household belongings so they were ready to go in the afterlife. A more modern approach is to use cryogenics and freeze the dead so they too will be preserved for reawakening at a later date. Science fiction movies have popularized the cryogenic approach to time travel outside the galaxy, but this approach to life prolongation remains elusive.

One of the most interesting aspects of life prolongation is the effect of diet on lifespan. Is there some magic food that when consumed would slow or even reserve aging? The answer is theoretically "yes." Resveratrol is a dietary supplement touted for exactly this purpose. Of course, everyone wants to know if it works. To date, it has worked in prolonging the life of mice, but no human studies have been conducted. This article examines resveratrol and its potential as the modern fountain of youth.

What Is Resveratrol?

Resveratrol is a compound found in fermented red grapes and Japanese knotweed among 72 other plant sources. Resveratrol is 3,5,4'-trihydrostilbene, a stilbene composed of 2 aromatic rings joined by methylene bridge. It is a specific member of the stilbene family known as viniferins, which contain phytoalexin polymers important in the prevention of plant bacterial and fungal infections.

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How Does Resveratrol Function?

Resveratrol has been found to affect sirtuins, which remove acetyl groups from proteins. Sirtuins are enzymes characterized as deacetylases/mono-adenosine diphosphate (ADP)-ribosyltransferases found in both lower and higher organisms. The name sirtuin comes from the Sir2 gene that stands for silent information regulator 2. Sirtuins remove acetyl groups in the presence of nicotinamide adenine dinucleotide (NAD) and add it to the ADP-ribose part of NAD to form ADP. Adenosine diphosphate is a lower energy form of adenosine triphosphate, the energy source responsible for human life. Thus, sirtuins are linked to energy production, which also is related to the regulation of aging, since less energy production is a hallmark of human aging.

What Effect Does Resveratrol Have on Proteins?

Resveratrol has an effect on specific proteins known as histones. Histones are tiny protein balls on which deoxyribonucleic acid (DNA) is wrapped to allow it within the confines of the cell nucleus. When DNA wraps on the histone, a nucleosome core is formed with 146 base pairs of DNA. For replication to occur, this DNA spool must unwrap. The histones must be acetylated, through the addition of acetic acid, to become active and allow the DNA to unwrap and must be deacetylated for the histones to become less active. When the histones are deacetylated, the condensed DNA does not unwrap and transcription cannot occur.

How does resveratrol fit into this picture? Sirtuins are initiators of histone deacetylation capable of inactivating certain segments of DNA. Sirtuins are activated by resveratrol. Thus, resveratrol turns on the deacetylation process making it an antiaging and anticancer agent. This is the same effect that is observed with caloric restriction, but the exact details are still not well understood.

What Are the Other Effects of Resveratrol?

Resveratrol also can function as a potent antioxidant. It contains 2 aromatic groups and may function as a better oral antioxidant than vitamins C and E. It is the

antioxidative capabilities of resveratrol that may be effective in reducing coronary artery disease and may be the rationale behind drinking a glass of red wine in order to inhibit the onset of heart ailments. Resveratrol can inhibit the oxidation of low density lipoproteins, which are increased in atherosclerosis. Resveratrol also may inhibit platelet aggregation and cause vasorelaxation in endothelium-intact and endothelium-dependent aortic rings by the action of nitric oxide-dependent and nitric oxide-independent mechanisms.

Does Resveratrol Have an Effect on Cancer?

It appears that resveratrol may have an effect on cancer as an antiproliferative that arrests the cell cycle. The main mechanism that is used to arrest the cell cycle is apoptosis. Apoptosis is the method used by the body to destroy abnormal cells that might result in cancer formation, if not eliminated. There are 2 mechanisms in the body associated with the reduction in cell proliferation: activation of the p53 gene and suppression of nuclear factor-κB (NF-κB) and activator protein 1. Resveratrol may block the inflammatory process by inhibiting NF-κB. The exact mechanism by which resveratrol inhibits NF-κB activation is unknown.

Summary

Caloric restriction is the only activity that has ever been proven to prolong life in rodents. A human caloric restriction experiment would be impossible to conduct given current Institutional Review Board requirements. Resveratrol is the best investigated substance for mimicking caloric restriction in humans. It appears to slow down genetic aging by affecting the sirtuin 1 gene, which is the mammalian analogue of the Sir2 gene. The problem is that no one knows the exact dose necessary to achieve longevity. Most dietary experts have recommended between 100 and 200 mg of resveratrol daily. At present, it appears that the fountain of youth remains elusive, but resveratrol is certainly one of the possible candidates.

Recommended Readings

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