

A Review of Antioxidant Foods' Power in Maintaining a Healthy Heart

B. Saha*

Former lecturer, NESCOL College, EPSOM, Surrey, UK

*Corresponding author: bensaha19@yahoo.com

Abstract This article highlights a review of how to maintain a healthy heart by consuming various appropriate foods. The emphasis is given to antioxidant foods which are necessary to maintain a healthy heart. Antioxidant foods which are conducive to the different parts of the brain controlling the heart beat as well as for the heart itself including its immune system are illustrated accordingly. A highlight of heart's normal structure and its function is also presented in this context.

Keywords: heart beat, antioxidant food, oxygen free radical, oxidation process, heart conditions, immune system, healthy heart, balanced foods, longevity, telomere science

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1. Introduction

The use of antioxidant foods for maintenance of normal health against many diseases is well known to the medical researcher, food expert and nutritionist and medical professional. The reason for such a benefit is relied on the ability of these foods to nullify the ensuing detrimental effect of oxygen free radicals (or, simply "free radicals") which are generated within the body due to chemical reactions resulting from external and internal factors [1]. The article will revisit the destructive nature of oxygen free radicals. It will then focus on the application of antioxidant foods to maintain a healthy heart. The principle of the approach is based on the fact that 'prevention is better than cure'. Commencing from the study of the brain action to control normal heart beat, the specific foods required for (i) the parts of the brain which regulate heart's rhythms, (ii) maintenance of heart's normal function and (iii) strengthening and maintenance of heart's inherent immune system will be presented in details.

2. A Highlight of Heart's Normal Structure and Its Function

Among the organs within the human body, heart is one of the most important parts – its disease-free function is, thus, paramount in everyday's survival.

Heart is considered to be the reservoir of the body's powerhouse. Its pump actions regulate/control the human being to continue to exist. The heart automatically contracts about once a second, forcing the blood around the body. It is surrounded by a tough jacket called pericardium. The heart works as a single unit, but is actually two pumps side by side, separated by a muscular

wall called a septum. One pump sends the blood into the lungs to get oxygenated; the other sends the oxygen rich blood around the body [2] (Refer to Figure 1. A normal heart and its function [3]).

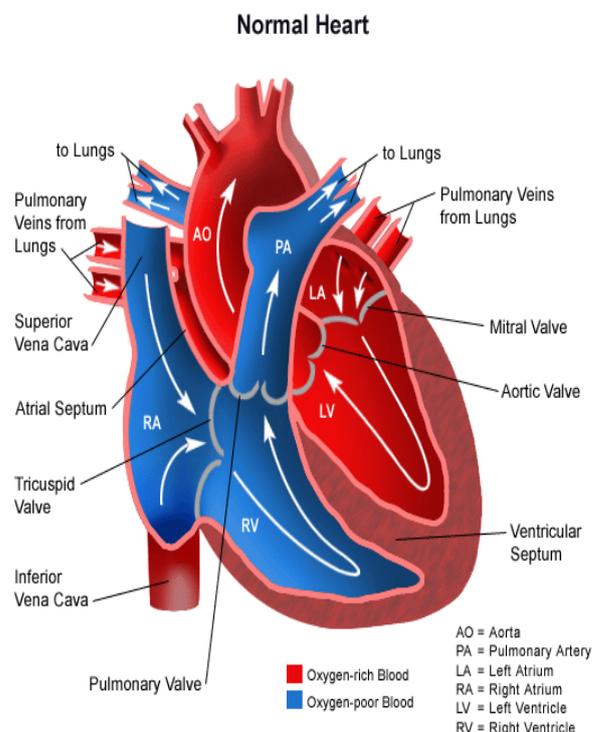


Figure 1. Normal heart and its function

3. What is Normal Heart Beat?

Human heart has its own in-built rhythms. Without control that is exerted by the brain, the heart would beat at its natural intrinsic rate of about 100 times per minute.

However, a region known as the cardio regulatory centre in the 'medulla of the brain-stem' (see Figure 2: Brain's influence on heart rhythm [4]) sends electrical impulses along the nerves (in particular through the "vagus nerve"- refers to light blue line in Figure 2) to set an average pulse rate of 70 beats per minute (b.p.m.). This is normal heart beat when a person is at rest. Moreover, during physical activity (e.g. exercise) or under stress, the sympathetic

cardiac nerve, controlled by the brain's hypothalamus (see the purple blue line in Figure 2) conveys the overriding signals to speed up the heart rate. This heart rate is also affected by the body's hormones such as adrenaline, which is activated when sudden fear or danger appears.

It is thus accepted that normal heart beat at rest should range between 60 b.p.m. to 80 b.p.m., averaged at about 70 b.p.m.

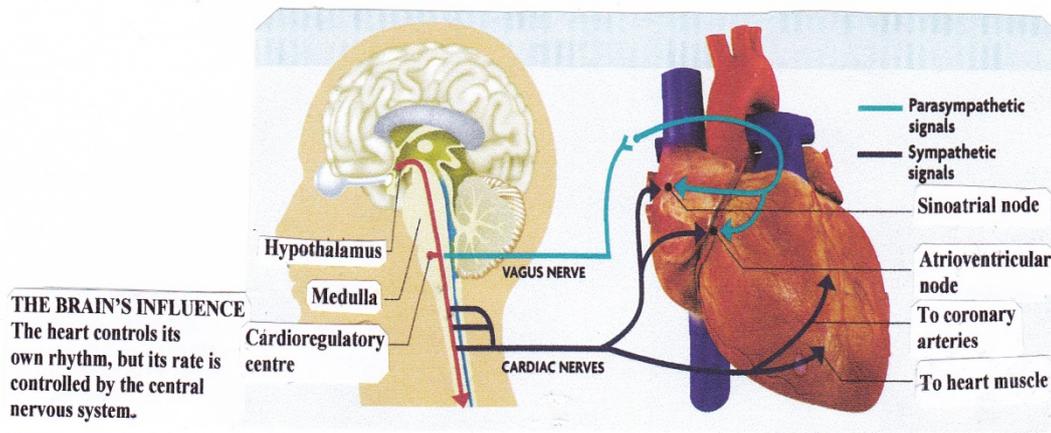


Figure 2. Brain's influence on heart rhythm

Note on Figure 2: (i) The two parts of the brain: hypothalamus (connected to 'cardiac nerves'- purple blue lines) and cardio regulatory centre (connected to 'vagus nerve'- light blue line) are sending signals to different parts of the heart to control the heart beat. The purple blue lines carry sympathetic signals and the light blue lines, parasympathetic signals for overall control of heart beats by the brain. Moreover, the sympathetic nerve signals prepare the heart for intense physical activity and the parasympathetic nerve signals have the opposite effect and relax the heart.

4. Destructive Nature of Oxygen free Radicals – Oxidation Process [5]

Normal body functions, such as breathing or physical activity and other lifestyle habits (such as smoking) produce substances, by chemical reactions within the body, called oxygen free radicals (OFRs) that attack body's healthy cells (see Figure 3. Damage to normal heart cell by oxygen free radical [1,6]). When the heart's healthy cells are attacked and weakened, they are susceptible to cardio-vascular disease and certain types of cancer.

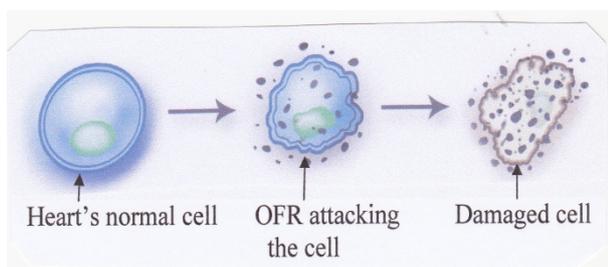


Figure 3. Damage to normal heart cell by OFR

Oxygen free radical molecule (OFR) is devoid of one electron in its outer shell of the atomic structure. Thus it will attack any parts of the body including the heart's cells to gain this electron. Once this heart's cell has lost its electron to OFR molecule, the cell becomes unbalanced and a chain reaction takes place.

The OFR molecule multiplies and takes over the rest of the heart cell and makes the heart weak over a period of time. This symptom is manifested in several forms, e.g. inflammation, chest pain, chronic headache, abdominal pain, poor concentration and the like [1]. If left untreated, the arteries of the heart itself and the other parts of the body will be affected. The flow of blood through the coronary arteries of the heart will be constricted resulting in heart disease and other types of ailment due to clogged up arteries. The condition will affect the heart muscles, giving rise to other categories of heart conditions.

5. Antioxidant (AO) Foods' Protective Power [7,8]

An AO is a molecule that inhibits the oxidation of other healthy molecules in the body tissues. Oxidation is a chemical reaction that can produce oxygen free radicals, leading to chain reactions that may damage heart's cells. The process of protection of heart's cells against an oxygen free radical molecule by an antioxidant food is illustrated in Figure 4 [1].

It is evident from Figure 4 that the harmful oxygen free radical's atomic structure, devoid of one electron in the outer shell, is neutralised by timely transfer of an electron from the outer shell of an antioxidant food. This particular antioxidant food later on gains its full strength from the assistance of other antioxidant foods (for example, Vitamin E shell structure's one electron, imparted to the

oxygen free radical atomic structure's shell to stabilise the latter, will be replenished by vitamin C's electron contribution. Such a balance among the antioxidant foods themselves is continuously maintained).

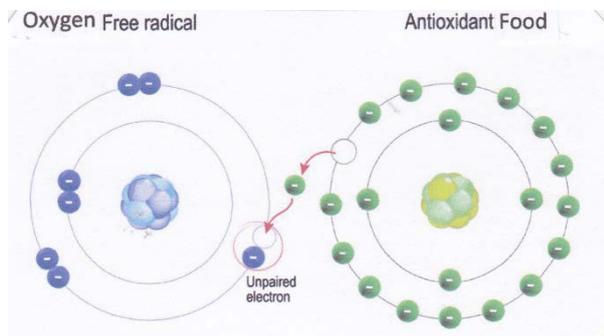


Figure 4. Human body cell protection by an antioxidant food against the attack by oxygen free radical

6. Foods that Can Regulate/Control Normal Heart Function

Three elementary systems/mechanisms (see [Figure 2](#)) within the human brain control regular heart beat action:

- Cardioregulatory centre in the medulla of the brain-stem
- Cardiac nerve system, controlled by hypothalamus
- Vagus nerve system

It is thus important that the normal functions of the above parts of the brain should be properly maintained, as advised in this article, by taking proper foods of antioxidant nature (see [Section 7](#)).

Besides, the heart itself to be disease free means it has to carry on its regular function throughout the life time of a person. Because a heart disease, for example, of cardiovascular nature, has the potential detrimental effect of attacking and damaging the proper function of the heart, it has to be made strong and sturdy by use of antioxidant foods as well (see [Sections 8](#) and [10](#)). Also heart's inherent immune system has to be properly maintained and enhanced, as appropriate (see [Section 9](#)). **Notes:** (i) Cardiovascular disease: it happens when the normal blood flow through the arteries of the heart muscles is restricted. (ii) Heart's inherent immune system refers to all body's immune/protection system as well.

7. Types of Foods for Normal Heart Beat as Controlled by the Brain [\[9\]](#) (Cross-refer to [Section 6](#))

For this purpose, it is advised to eat daily quota of:

- Specific antioxidant foods for active brain, such as:
 - thiamine - Vitamin B₁ - which includes a variety of protein foods
 - riboflavin - Vitamin B₂
 - beta-carotene and
 - Iron,
- Protein:
 - lean meat
 - skimmed milk or
 - other protein containing foods
- low-fat seafood
- low-fat yogurt,
- Fruits, and nuts (which generally contain high quantities of boron element)
- Omega 3 contents obtained from the oily fish, like sardine, salmon,
- Specific fruits, like blue berries and avocados.

8. Types of Foods for Healthy Heart (Cross-refer to [Section 6](#))

Foods that can save arteries and prevent heart disease are listed below [\[10\]](#):

- Seafood (For example, Mollusc, crustacean, fish – like cod, salmon, trout, tuna, haddock, plaice, crab, shrimps, lobster, prawn) (refer to [Figure 5](#): A seafood platter – fruits of the sea, as an example [\[11\]](#))



Figure 5. A seafood platter - fruits of the sea

- Fruits (For example, oranges, grapes, papaya, bananas, apples, limes)
- Vegetables (For example, all green leafy vegetables including asparagus, spinach, radishes, tomatoes, mushrooms, carrots, sweet potatoes and red beans)
- Nuts (all types of nuts, especially peanuts and cashew nuts)
- Grains (For example, whole rye, oats, barley, millet, brown rice, corn, wheat)
- Legumes (beans, lentils, peas)
- Garlic
- Onions
- Olive oil (cold-pressed extra virgin olive oil is recommended)
- Red wine (one or two drinks* a day or less frequently) [\[12,13,14\]](#) (refer to [Figure 6](#), as an example [\[15\]](#)).

***Note:** For men, this means having no more than two drinks a day. For women, who are more susceptible to alcohol's effects, should limit themselves to no more than one drink a day (also note: one red wine drink means 5 ounce (=150 ml)).

- Foods high in vitamins C and E and carotenoids



Figure 6. A person musing over a red wine drink

At this point of time, antioxidant foods, such as vitamins C and E and carotenoids which include beta-carotene, lycopene and lutein – will help protect the healthy cells of the heart from damage being caused by

oxygen free radicals. They are essential to maintain a healthy heart.

Notes: (i) Carotenoids: Foods high in carotenoids include: red orange, deep yellow and dark-green leafy vegetables, tomatoes, carrots, spinach, Brussels sprouts, sweet potatoes, winter squash and broccoli. (ii) Vitamin E (Tocopherol): This is found in vegetable oils, salad dressings, margarine, wheat germ, whole grain products, seeds, nuts, and peanut butter. (iii) Vitamin C: Found in foods like citrus fruits (oranges, melon, and tangerines), strawberries, sweet peppers, tomatoes, broccoli and potatoes.

One analysis found that citrus foods (see [Figure 7](#): A range of citrus fruits, as an example [16]) contain 58 known anti-cancer chemicals more than any other food [17]



Figure 7. A range of citrus fruits

9. Types of Foods for Protection of Heart's Inherent Immune Functions (Cross-refer to Section 6)

Foods that are expected to protect and enhance the heart's immune functions are [18]: (a) Yogurt (b) Shitake mushroom (c) Garlic and those foods rich in beta-carotene and vitamin C (d) Vegetarian's diet (e) Fruits and vegetables (f) Limited amount of red wine – say, one glass a day (g) Seafood, especially fatty fish and shellfish, as well as other foods high in zinc (for example, as found in offal, meat, mushroom, oyster, eggs, whole grain and brewer's yeast).

10. Maintaining Healthy Heart with Balanced Foods [19] (Cross-refer to Section 6)

As advised by the British Heart Foundation (BHF), a balanced diet is necessary to maintain a healthy heart (refer to [Figure 8](#): A picture of balanced diet, as an example [20]).

The best way to follow the instructions of the BHF is to eat foods of the following category:

- Plenty of fruits and vegetables
- Plenty of starchy foods, such as bread, rice, potatoes and pasta. Wholegrain varieties are to be

selected wherever possible

- Some milk (semi-skimmed) and dairy products (low fat types)
- Some meat (lean meat), fish designated with omega 3 category, eggs, beans and other sources of protein
- Only small amount of foods and non-alcoholic drinks high in saturated fats and/or sugar
- Food options are to be chosen that are lower in fat, salt and sugar, wherever a person can.



Figure 8. A picture of balanced diet

It is also to be noted that there are plenty of instructions available for the daily amount of fruits and vegetables to be eaten, for example, from the Government Agencies, and from other books available in the market [21].

11. Conclusion

The author has presented a review of the use of antioxidant foods for maintaining a healthy heart.

The specific foods required to maintain the relevant parts of the brain controlling the heart beat together with those required for the heart itself and the heart's immune system have been clearly illustrated.

The power of antioxidant properties of foods in nullifying the detrimental effect of the oxygen free radicals has been demonstrated through the study of the atomic structure of this type of food and that of the oxygen free radical.

It is to be remembered that foods of this nature are required for strengthening the heart itself and that of heart's inherent immune system. By combined actions of both of these protective measures, a healthy heart can be maintained.

Concluding note: At the same time, it is to be noted that the human body cannot be sustained beyond the ultimate "boundary of longevity" of human being, which has turned out to be of the order of 117 years [22]. A telomere science is being studied and developed in the USA and in other parts of the world which has the potential to extend the human life expectancy beyond this "boundary" [23,24,25].

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