Intermittent Fasting and Regeneration of Immune System

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Abstract

For the past two decades there has been much controversy in the scientific field about whether or not fasting is beneficial to one's health. A few years ago researchers began to study fasting and the benefits it holds. In the end, they uncovered many benefits, but the main focus was the immune system. To the researchers surprise, fasting for as little as two or three days can re-boot or thrive one's immune system. It is said that fasting “flips a regenerative switch.” This paper examines how fasting as little as two days in the week can have an impact on one's immune system. It uses online sources and a study to prove that fasting protects against cancer cell formation, reduces free radical damage, and reduces inflammation in the body.

Intermittent Fasting and Regeneration of Immune System

Fasting is defined as the willing of partial or complete abstinence from food, drink, or both. ​The​ ​common​ ​dietary​ ​practice​ ​of​ ​fasting​ ​is​ ​to​ ​consume​ ​a​ ​light​ ​meal​ ​of​ ​​ ​“breakfast”​ ​or

Suhur​ ​before​ ​dawn​ ​in​ ​order​ ​to​ ​start​ ​the​ ​fast​ ​and​ ​a​ ​larger​ ​meal,​ ​Iftar,​ ​when​ ​breaking​ ​the​ ​fast​ ​after

Sunset. Fasting is widely done to improve health and increase longevity rather than consuming pharmaceuticals. Fasting is also done regularly in various religions for spiritual benefits.

It was narrated from Hunaidah bin Khalid, from his wife, that one of the wives of the Prophet said: “The Prophet used to fast the ten (days), and three days of each month: Monday and Thursday.” (Sahih) Muslims have the choice of fasting Mondays and Thursdays of every week, but may not be aware of the benefits fasting those two days can have on the immune system. This project is to inform people of all faiths of the benefits of fast on the immune system and at the cellular level from fasting two to three days a week. Although it is a difficult act, intermittent and short-term fasting of regular, bi-weekly intermittent and short-term fasting protects against cancer cell formation, reduces free radical damage, and reduces inflammation in the body.

The Messenger of Allah (saw) addressed his companions on the last day of Sha`ban, saying, "Oh people! A great month has come over you; a blessed month; a month in which is a night better than a thousand months; month in which Allah has made it compulsory upon you to fast by day, and voluntary to pray by night. Whoever draws nearer (to Allah) by performing any of the (optional) good deeds in (this month) shall receive the same reward as performing an obligatory deed at any other time, and whoever discharges an obligatory deed in (this month) shall receive the reward of performing seventy obligations at any other time. It is the month of patience, and the reward of patience is Heaven. It is the month of charity, and a month in which a believer's sustenance is increased. Whoever gives food to a fasting person to break his fast, shall have his sins forgiven, and he will be saved from the Fire of Hell, and he shall have the same reward as the fasting person, without his reward being diminished at all." (Ibn Khuzaymah) The month of Ramadan is a time where Muslims worldwide fast. The moon’s position is heavily depended on for calculating the start date and end date of Ramadan. Due to the fact that the Islamic calendar is a lunar calendar, the first day of Ramadan advances about 11 days each year in relation to the Gregorian calendar. Ramadan falls on different days, in different months, in different seasons over a 33 year cycle. Because of this shift, the amount of hours that are fasted are different. During these 29 to 30 days, Muslims forgo all foods and liquid drinks from dawn till the sun has set. Once the sun sets, that is when the breaking of the fast occurs. This is an intense practice, that not only affects a person spiritually, but also physically. During this month, Muslims perform extra prayers, increase the reading of the Holy Book (the Quran), feed the hungry and poor, and give charity.

Fasting in the month of Ramadan is one of the five pillars of Islam. Allah has mentioned the reason and wisdom behind fasting, as He says : “O you who believe! Observing As-Sawm (the fasting) is prescribed for you as it was prescribed for those before you, that you may become Al-Muttaqoon (the pious).” (The Quran Al-Baqarah 2:183) It is obligatory for every Muslim with a few exceptions. One is exempted from fasting if their health will be badly affected by it or if they are travelling, but the loss should be made up after Ramadan. In order to fast, one must be of the age of puberty. Many children start to fast at an early age for it helps them later on. One must also be sane and able. If this fast is not observed by someone who is qualified for it then they have sinned. A fast becomes void by intentional consumption of food, liquids, smoking, or sexual activity.

There are other times when Muslims voluntarily fast. To follow the tradition of the Prophet, it is recommended for Muslims to fast Mondays and Thursdays of every week, six days after Eid (a “celebration” that marks the end of Ramadan), and the three “white” days when the moon is full of each month. The fast that will be covered in this paper is the voluntary fasting on Mondays and Thursdays by Muslims for it is a two-day fast that has become a popular topic.

Fasting has been called the “miracle cure” due to the physical conditions it improves. Because fasting initiates the body's own healing mechanisms, any condition can show improvement (Katie, 2008). Sometimes bodies suffer by overworking themselves by eating excess food on a continuous basis. People often think that they get energy from their food, but it is estimated that 65% of the body’s energy is directed to the digestive system after a heavy meal (Katie, 2008). So, fasting frees up this energy which can be used for other things like eliminating toxins.

Numerous studies have been conducted on how a two- to three-day fast can “boost” the immune system. Although nutritionists criticize fasting diets for being unhealthy, studies conducted in 2014 suggested otherwise. “Starving” the body kick-starts stem cells into producing new white blood cells, which help fight off infection (Knapton, 2016). This discovery helps people with a weak or damaged immune systems like cancer patients undergoing chemotherapy or the elderly. As people grow older, their immune system weakens which makes it harder for them to fight off common disease. According to these studies, fasting could help them get their immune system good as new.

One thoroughly researched study was done by a team in the University of Southern California (USC). The research was published in the journal *Cell Metabolism* in June of 2014 and lead by Valter Longo, who studies aging and longevity, and Mario Mirisola. The study looked at both mice and human studies. For both species, when fasting the white blood cell count lowered causing the immune system to start producing new ones. Fasting caused the white blood cell count to be lowered because it forced the body to “recycle” the immune systems cells that is not needed. "When you starve, the system tries to save energy, and one of the things it can do to save energy is to recycle a lot of the immune cells that are not needed, especially those that may be damaged," Longo said. "What we started noticing in both our human work and animal work is that the white blood cell count goes down with prolonged fasting. Then when you re-feed, the blood cells come back. So we started thinking, well, where does it come from?" Two of the key mechanisms are an enzyme called PKA (Protein Kinase A) and a hormone called IGF-1 (Insulin-like Growth Factor 1), both of which are reduced by fasting. In order for the immune system to go under regenerative mode the enzyme PKA has to shut down.

The research had major indications for healthier aging. The immune system's deterioration contributes to the exposition to disease as one ages. The research also implied that fasting for 72 hours lessens some of the harmful effects of chemotherapy on cancer patients. Chemotherapy and other cancer treatments cause collateral damage on the immune system. Thinking there is no other way, cancer patients usually end up taking medication in order to boost their immune system. A [2009 case](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2815756/) studied ten cancer patients – four with breast cancer, two with prostate cancer, one each with ovarian, lung, uterine, and esophageal cancers. They all underwent fasting prior to and after chemotherapy treatment. Fasting times ranged from 48-140 hours prior to and 5-56 hours after. All resulted with a reduction in side effects of chemotherapy. Although there are other cases underway, the first case results were published. A 51-year old woman with breast cancer did her first round of chemotherapy in a fasted state of 140 hours. Other than dry mouth, fatigue, and hiccups, she felt well enough to go to work and resume her normal daily activities. For the next two rounds, she did not fast and instead ate her normal diet, and the side effects were extreme – severe fatigue, diarrhea, weakness, abdominal pain, nausea – which prevented her from returning to work. For her fourth round of chemotherapy, she fasted, and the side effects were again minimized. Another improvement was in the total white blood cell level, absolute neutrophil counts, and platelet counts which were all highest after the fasting regimens (Sisson, 2012). Fasting forces the body to reboot its immune system. It also improves the immune system of those with a wide range of immune system deficiencies, including autoimmunity disorders.

Autoimmune disorders are immune system disorders that causes inflammation in the joints and tissues, and affects the kidney, the skin, the joints, the brain, and other organs. When the body is deprived of food, it releases a compound called β-hydroxybutyrate (BHB) that is part of a complex set of proteins called the inflammasome. The inflammasome drives the inflammatory response in several disorders including autoimmune diseases, type 2 diabetes, Alzheimer's disease, atherosclerosis, and autoinflammatory disorders (Iacurci , 2015). "These findings are important because endogenous metabolites like BHB that block the NLRP3 inflammasome could be relevant against many inflammatory diseases, including those where there are mutations in the NLRP3 genes," Vishwa Deep Dixit, one of the researchers at the Yale School of Medicine said. BHB is a metabolite produced by the body because of fasting. It was known that fasting reduced inflammation in the body, but it was not known how the immune cells react to the reduction of glucose and if they respond to the BHB or the metabolite that is produced from oxidation of fat. A study was conducted and published in the journal, *Nature Medicine*. Mice with inflammatory diseases caused by NLRP3 (an inflammasome) were used and exposed to BHB. Macrophages are the immune cells that produce inflammation, so they were the main focus of this study. The presence of BHB reduced the inflammation which indicates that the presence of BHB can reduce the NLRP3 inflammasome (Dixit et al., 2015). "Our results suggest that the endogenous metabolites like BHB that are produced during low-carb dieting, fasting, or high-intensity exercise can lower the NLRP3 inflammasome," Dixit concluded.

Method

This research examines the benefits that fasting for a few days has not only on the body, but the immune system specifically. It focuses on how the fasting affects three particular things: cancer cell formation, radical damage, and inflammation. These three things impact one's health which impacts longevity.

In order to understand this concept one must know the importance of the immune system and the importance of a healthy immune system. The importance of the immune system cannot be underestimated. It is a crucial component of our body that leads to a healthy and longer life. The immune system is responsible for keeping one's body healthy as a whole, free from illnesses and infections. When something foreign like a bacteria or any other agent tries to invade the body , a network of cells, tissues, and organs that work together (immune system) deals with it and prevents it from causing any damage to the body. The immune system fights invaders outside and inside the body. It fights to keep them out and when that fails the immune cells go after to destroy them before any damage is done. The immune system is complex and its many organs are located all throughout the body. This system contains lymphocytes (small white blood cells), the bone marrow (soft tissue in the bones), the thymus, along with other organs. (National Institutes of Health, 2007)

A great deal of research was done for this paper. Insight was needed in order to understand the topic for it is not something that can be wholly depended on prior knowledge. Books and online resources were used to back up and support the information presented and to gain further knowledge. The Holy Quran and various Islamic resources were used to support the Islamic portion of this paper along with information that was acquired in previous years. A mentor also provided input of knowledge and opinions to make this project a success.

Primary research was also conducted. A small group of people who have been fasting two days a week for some time were asked to participate in a short survey. This survey provided information that would show the difference fasting has on one's immune system. The participants were asked numerous questions such as how long they have been fasting twice a week, how many times have they gotten sick within a year, how fasting impacts their immune system, or if they have any illnesses (ex: diabetes) etc. General questions were also asked like gender, age, and weight.

Limitations

Unfortunately, there are a few factors that limited this research. There was very little research conducted that studied fastings impact on the the immune system alone. This made it difficult to give more support to this topic. Due to the limited amount of time and equipment, the results from the product were not as beneficial as they may have been had the study involved a larger number of participants with varying levels of health. There would have been many participants with different health giving a variety of results and covering all the three points that were mentioned in the thesis.

Discussion

The information found through research agrees with the hypothesis presented in this paper. Although, the survey that was conducted did not correlate with the main points of the paper, it still provided more information that supported the thesis. Fasting two to three days can regenerate one's immune system. From the survey, the one’s who usually fast two days a week do not get sick throughout the year compared to the others who do not fast.

When one thinks about fasting, it is usually viewed as a burden or a chore. However, once the benefits on the body and mind are taken into account it is something that has an overwhelming positive impact. Fasting can be used as a way for everyone, Muslims and non-Muslims, to live a healthier lifestyle.

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