Functions of Omega-3 and Omega-6 in Prevention and Fighting Cardio-Metabolic Complications

Halim M\textsuperscript{1*}, Halim A\textsuperscript{2**}

\textsuperscript{1}University of Salford, MSc Biomedical Science, Greater Manchester, United Kingdom
\textsuperscript{2}Zhong Shan Hospital, Shanghai Medical College, Fudan University, Shanghai, China

Corresponding Author(s): Michael Halim\textsuperscript{*} and Alice Halim\textsuperscript{**}

*Address: University of Salford, MSc Biomedical Science, Greater Manchester, United Kingdom; Email: michaelhalim1000@gmail.com

**Address: Zhong Shan Hospital, Shanghai Medical College, Fudan University, Shanghai, China; Email: alicehalim95@gmail.com

Received date: 23 July 2020; Accepted date: 26 August 2020; Published date: 15 September 2020


Copyright © 2020 Halim M, Halim A. This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

**Background:** Cardio-metabolic disease is one of the deadliest diseases responsible for the current mortality and morbidity cases. Smoking, drinking alcohol, poor diet, sedentary activities, and malnutrition are some of the modifiable behaviors attributed to the cardio-metabolic disease. Improving dietary operations helps in the eradication of cardio-metabolic complications because the consumption of a balanced diet improves the pleiotropic functioning of cells. It also regulates the inflammatory as well as properties that are against inflammatory acids in the cardiovascular protection process. The purpose of this research is to study the function of Omega-3 and Omega-6 single-chain lipids acids in enhancing cardio-metabolic health.

**Methodology:** Researchers visited several medical databases required in the acquisition of relevant information and analysis to evaluate the functional importance and effectiveness of Omega-3 and Omega-6 single-chain lipids in the prevention of cardio-metabolic complications.

**Results:** The findings of the research, as mentioned above process, showed that Omega-3 and Omega-6 acids keep the cells off from contracting cardio-metabolic complications. They perform this operation by lowering the inflammatory index of arteries, reducing blood clotting, and decreasing the level of low-density lipoproteins in the body.

**Conclusion:** Polyunsaturated fatty acids (PUFAs) protect the body from cardio-metabolic risk. The human diet should have the right constituent of PUFAs to increase the concentration of single-chain lipids required to protect cardio-metabolic disease in the body.

Keywords

Omega-3, Omega-6, Polyunsaturated Fatty Acids, Cardio-metabolic Health, Inflammation
Introduction

Definition, Causes, and Examples:

The commentary points out that cardio-metabolic health complications include cardiovascular diseases such as heart failure, cardiomyopathy, and heart attack, as well as metabolic disorders such as stroke and obesity [1]. Hypertension, poor glucose intolerance, resistance to insulin, dyslipidemia, and central adiposity are the main characteristics of cardio-metabolic disease [2]. Vincent et al. [3] illustrate that cardiovascular complications are characterised by poor or short sleeping patterns, poor diets, as well as little or no physical body activities [4], which result in complications such as high blood pressure and obesity [5]. PUFAs are fatty acids that have a composition of two or more double bonds in their chemical structure such as Omega-6 and Omega-3 [6]. PUFAs are commonly obtained in dietary foods to enhance cardiometabolic protection of the body.

Methodology

To evaluate the importance of Omega-6 and Omega-3 PUFAs in the prevention of cardio-metabolic complications, researchers acquired relevant information and analyses from a range of medical databases, incorporating several keywords such as multi-unsaturated single-chain lipids, cardio-metabolic curation, Omega-3, Omega-6, and inflammation, among other relevant terms to this study [7]. or accuracy, efficiency, and reliability of outcome, researchers applied an automated technology regarding, employing inclusion and exclusion critique to improve the research process, reduce human effort, and arrive at objectives quickly [8].

Results

Different PUFAs have different impacts on the ability of the body to fight cardio-metabolic dysfunctions. Findings indicated the replacement of "saturated fatty acids with unsaturated fatty acids" in our dietary activities is necessary for fighting cardio-metabolic dysfunction [9]. In a statement, Clifton et al. [10] argue that foods rich in Omega-3 and Omega-6 are rich in PUFAs that provides required defense against cardio-metabolic dysfunctions.

Omega-3 and Omega-6 are also useful in regulating platelets and functional thrombosis [11]. From the findings, a combination dose of Omega-3, rich in PUFAs such as EPA and DHA that contain a composition of heart regulons can last up to several months, and that triglycerides lower the impact of cardiovascular dysfunction up for to one year.

Effects of Omega-3 and Omega-6 on inflammation and Cardio-metabolic Health:

One critical point to consider According to [12], inflammation protects against infections and injuries hence vital for survival, although an excess of it is harmful. The effect of Omega-3 and Omega-6 has antithrombotic properties, and pharmaceutical and therapeutic strategies would be useful in establishing the link between inflammation and cardio-metabolic diseases [13]. The review article claims that diet is essential for inflammation due to substances like cytokines that contribute to cardio-metabolic diseases. Kinds of seafood like Eskimos are rich in PUFAs that are important for body defense against cardio-metabolic complications. Omega-6 and Omega-3 supplements can as well be manufactured from laboratories and sold as pharmaceutical medicine. Sufficient consumption of foods rich in PUFAs, such as Omega-3 and Omega-6, influences the occurrence of inflammation in the body as well as cardio-metabolic health status in individuals [14].

Impact of Omega-6 and Omega-3 in Thrombogenesis:

Inflammation and oxidative processes are related to thrombosis, as illustrated by Table-1 below:

<table>
<thead>
<tr>
<th>Clotting and endothelial</th>
<th>EPA</th>
<th>DHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clotting</td>
<td>Reduces coagulation of platelets.</td>
<td>Reduces platelet aggregates stimulated by collagen</td>
</tr>
<tr>
<td>Endothelial Function</td>
<td>limits cases of inflammation and oxidative stress</td>
<td>Improves immunity by reducing inflammation and oxidative stress</td>
</tr>
</tbody>
</table>

According to the commentary Table-1 above, EPA and DHA improve thrombogenesis and inflammatory immunity by reducing catalytic production of thrombin. Reduced output of thrombin under the inhibition activity of EPA and DHA translates to a reduction in platelet coagulation, which leads to reduced inflammation and oxidative stress in endothelial [15]. Similarly, thrombin inhibition activity of EPA and DHA would eradicate the coagulation process, reducing collagen-stimulated aggregates of platelets in the system. The reduced collagen-stimulated aggregates of platelets lead to reduced inflammation and oxidative stress. In other biological mechanisms, EPA and DHA play a significant role in cardio-protection, regulation of antiarrhythmic effects, and stabilizing myocardial efficiency.

The reviewers argue that high levels of polyunsaturated fatty acids replace arachidonic acid levels in the phospholipid membrane [9], which, in turn, decreases the binding process and synthesis of thromboxane. During this process, an additional output of thromboxane-A3 exerts some profound biological effects on the body compared to thromboxane A2. This process limits the activity of cyclo-oxygenase-1 and cyclo-oxygenase-2 in the neutrophils and platelet structures promoting aggregation processes, as indicated by Fig-1 [12].

Vitro and Vivo results indicate that supplementation of additional PUFAs affects the reduction of thromboxane type 2 synthesis [11]. The reduction of thromboxane type leads to adhesion as well as activation and reduction in the concentration of plasminogen activator inhibitor-1. Polyunsaturated fatty acids exhibit antithrombotic properties [15]. More precise analysis and effectiveness of Omega-3 PUFAs on thrombogenesis can be illustrated in a platelet model of the blood clotting process.

Omega-3 PUFAs impart their control of the role of curbing thrombogenesis using two key processes; replacing the arachidonic monomers in the to reduce the effect of COX-1 on the thrombogenesis effect and activation of TXA2 antagonist synthesis of protein DX to lipooxygenase catalase, responsible for the synthesis of inhibitors COX-1 and COX-2 [16].

More effective and common PUFAs like EPA and DHA have a favorable implication on the replacement process of arachidonic acid inside the membrane of the phospholipid structure.

The effects of DHA and EPA indicated a small and minimal impact on the thrombogenesis processes and were portrayed by their inability to trigger the platelet coagulation. Similarly, DHA and EPA showed the capacity to reduce inflammation and oxidative stress [17].
The cell metabolic structure is related to blood dislodge and squamous operation. According to [17], improved effects of EPA and DHA on the endothelial membrane improve the operational efficiency of arteries. However, the impact on the above-mentioned PUFAs on veins is quite uncertain.

Different research depicted by [17] shows that these two PUFAs can control thrombogenesis by acting as TGH2 and TXA2 antagonists in the production of DX since DHA is manufactured based on the LOX, which can inhibit COX-1 and COX-2. Over time, the human being has associated thromboembolism with endothelial function [15].

Conclusion
It should be noted that cardio-metabolic diseases contribute to high mortality and morbidity rates across all ages, races, and genders, and have become a burden to health and economy worldwide. Changes in lifestyle behaviours and dietary are useful preventive and management measures to these complications. Omega-3 PUFAs are essential in the reduction of and prevention of inflammation agents and cardiovascular diseases like thrombosis, while Omega-6 PUFAs lower cholesterol levels hence promoting cardiovascular health, although it is not clear as to whether Omega-6 PUFAs cause inflammation or not, with the release of inflammatory molecules like leukotrienes during its formation. Therefore, more research is necessary on the link between Omega-6 and inflammation.

References

Keywords: Omega-3, Omega-6, Polyunsaturated Fatty Acids, Cardio-metabolic Health, Inflammation

Commentary

[PMID: 30266534]