ACTA SCIENTIFIC NUTRITIONAL HEALTH (ISSN:2582-1423)

Volume 4 Issue 4 April 2020

Review Article

# Can the Use of a Functional Food Developed from Albarens Thunnus Reduce Blood Lipid Levels Improving Cardiovascular Health?

**Breixo Ventoso Garcia***

*PhD in Nutrition and Health, Nutrigenomics Specialist, Researcher, UNINI (Ibero-American International University), USA*

***Corresponding Author:** Breixo Ventoso Garcia, PhD in Nutrition and Health, Nutrigenomics Specialist, Researcher, UNINI (Ibero-American International University), USA.

**Received:** March 03, 2020

**Published:** March 19, 2020



## Abstract

Cardiovascular diseases (CVD) pose a threat to society in general and the breakthrough the cost of your treatment of different agencies Makes health ARISE new therapies to country clubs ITS slow progress.

The Increase in the consumption of saturated fat and sedentary lifestyles, act by accelerating the advance of CVD.

Poor nutrition causes there has a sharp decline in the consumption of nutrients: such as omega 3 polyunsaturated fatty acids.

The daily intake of omega-3 is lower than the recommended by major health agencies (WHO, EFSA) making it Necessary to Enhance ITS contribution to get the beneficial effects derived from consumption ITS.

An alternative is the use of functional foods rich in omega-3.

The use of a can of light tuna developed as a functional food has managed to Increase the daily intake of omega-3 (Getting to increase HDL levels) but has managed to reduce the Present levels of lipids in the blood.

**Keywords:** Omega 3; LDL; HDL; VLDL; Trigicéridos; Functional Foods

### Overall objective

Implement manufacture a can of light tuna to increase the daily intake of omega 3 and decrease some cardiovascular risk factors.

### Specific objectives

The specific objectives are:

- Develop a manufacturing methodology of the functional food, in particular a can of tuna with levels of omega 3 fatty acids above the market average.
- Carry out a pilot in human trial with daily consumption of said can for three months.
- Compare the variation in plasma levels of HDL, LDL, VLDL and triglycerides induced by the consumption of functional food.
- Analyze the variation in blood pressure induced by the consumption of functional food.

## Introduction

CVD is the leading cause of death worldwide. In 2008 it is estimated that killed 17.3 million people worldwide, which is 30% of all registered deaths [1]. 2030 is expected to die from these causes about 23.3 million people. Of the total deaths in 2008, 16.5% attributable to hypertension [2].

### Classification of cardiovascular disease

### CVDs differ

- Coronary heart disease, which is affecting the blood vessels supplying the heart muscle (myocardium)
- The vascular brain disease affecting the blood vessels supplying the brain
- Peripheral arterial disease, affecting the blood supply of upper and lower limbs.
- Rheumatic heart disease are myocardial injury and heart valve caused by rheumatic fever.
- Congenital heart disease, heart malformations from birth.
- Deep vein thrombosis and pulmonary embolism: blood clots that can break off and lodge in the blood vessels of the heart and lungs (thrombi).

The most common symptoms of these diseases are

- Pain or discomfort in the chest
- Pain or discomfort in the arm, left shoulder, jaw, or back.

In stroke (CVA)

- Sudden onset of numbness of the face
- Confusion difficulty speaking or understanding

- Motor difficulty,
- Intense headache
- Weakness, loss of consciousness.

Pharmacological treatments sometimes are essential as statins for lowering cholesterol, antihypertensives and aspirin, clopidogrel, as anticoagulants.

Statins [3] they are used to lower high cholesterol levels drugs, HMG-CoA reductase act by inhibiting (Figure 1).

Mechanism of action of statins inhibiting HGMO-CoA reductase

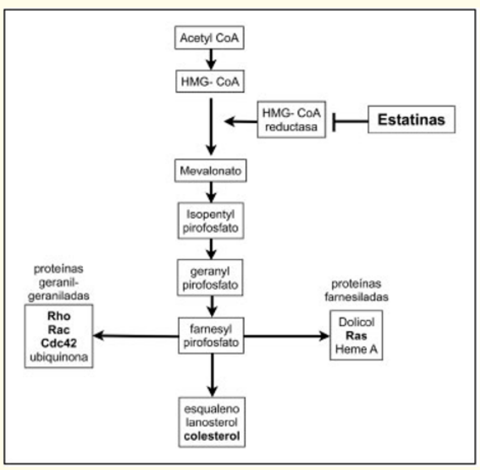


**Figure 1**

**Source:** Kaplan NM. Systemic hypertension: Treatment. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. 9th ed. Philadelphia, Pa: Elsevier Saunders; 2011: chap 46.

The body needs cholesterol for cells to function properly, there are two basic types

- Cholesterol low density lipoprotein or low-density lipoprotein cholesterol (LDL), it builds up in the arteries to form plaques that can block blood flow through them causing increased blood pressure leading to a stroke.
- The lipoprotein cholesterol high-density, high-density lipoprotein cholesterol (HDL) [4] helps move the fat circulating in the blood vessels to the liver to be metabolized rid of fat which may act by increasing levels of LDL, VLDL and triglycerides.

## Polyunsaturated essential fatty acids

- PUFAs are essential omega-3 fatty acids, humans can not synthesize itself and must be ingested through foods.
- Omega-3 are one type of polyunsaturated fatty acid necessary for the proper functioning of the body and improving the levels of lipoproteins (VLDL, HDL, LDL and triglycerides).
- Among the omega 3 are eicosapentaenoic acid (EPA) and docosahexaenoic (DHA) [5], the main sources are fatty fish such as tuna, mackerel and salmon, and the oil obtained from the species which is used as a supplement nutritional (nutraceutical).
- Both EPA and DHA once ingested are rapidly incorporated into phospholipids in cell membranes where they can be freed by the lipoxygenase and cyclooxygenase enzymes resulting products with cytoprotective and antiinflammatory properties.
- There are numerous studies supporting that consumption of EPA and DHA aid in the prevention or treatment of a number of diseases, especially those in which inflammation plays an important role in its development [6].

## Metabolism of omega-3

There are three basic routes to the metabolism of polyunsaturated fatty acids (PUFA) omega 3 that occur during and after absorption (Figure 2).

**Figure 2**

**Source:** Cunnane SC. Problems with essential fatty acids: a new paradigm for time Prog Lipid Res 2003; 42: 544-68.

- PUFAs are transported to the liver where incorporated into lipoproteins then be carried peripheral lipid stores.
- The cell membrane phospholipids are replaced by lipoprotein phospholipids then may act as precursors PUFA various eicosanoids.
- Most oxidizes to produce energy.

Metabolic pathway of omega 6 and omega 3 metabolites ALA, EPA and DHA.

The concentration of omega-3 phospholipids in plasma is related to the concentration of EPA and DHA incorporated into cell membranes. Pharmacokinetic studies in animals have shown that complete hydrolysis of the ethyl ester accompanied by absorption and satisfactory incorporation of eicosapentaenoic acid in the plasma phospholipids and cholesteryl esters thus takes place PUFAs are incorporated into lipoproteins to be transported to different metabolic and to replace the phospholipids of cell membranes by lipoprotein phospholipids routes, the concentration of omega 3 fatty acids in the plasma phospholipids corresponds to the concentration of EPA and incorporated into cell membranes [7] DHA.

### Chronic disease with mild systemic inflammation are risk factors for CVD: role of omega 3

Mild systemic inflammation is characteristic of coronopatías, stroke diabetes, hypertension, cancer and other diseases as vascular.

Omega3 through their anti-inflammatory effects have a positive effect on these diseases.

Obesity is associated with type 2 diabetes mellitus and increased risk of cardiovascular disease. Adipose tissue of an obese person has the ability to secrete several protein factors such as leptin, factor of tumor necrosis factor alpha (TNF-alpha), interleukin-6, the inhibitory plasminogen-1 (PAI-1), the resistin, adiponectin and retinol binding protein 4 (RBP4) [8].

Adipokines involved in inflammatory and metabolic processes influencing the development of atherosclerosis, dyslipidemia, hypertension and insulin resistance [8].

In obese people also increase other inflammatory markers such as C protein (CRP) and markers of endothelial dysfunction as all relevant selectin in cardiovascular processes.

Omega3 addition to its anti-inflammatory capacity derived resolvins, formed from EPA and DHA, are capable of increasing the secretion of adiponectin, which unlike TNF-alpha and IL-6 [8] can promote insulin sensitivity and develop an antiinflammatory effect, this has been tested both in obese humans as model in rodent models [8].

### Anti arrhythmic properties of omega-3

The anti arrhythmic of omega-3 capacities derived from their ability to hyperpolarize the membrane potential increasing ventricular excitability.

Therefore intake of foods rich in omega-3 PUFAs is effective in reducing risk factors for cardiac arrhythmias [9].

### Action mechanisms

Fatty acids have anticoagulant and antiinflammatory capacity, glass protective effects mainly from their incorporation into cell membranes, partially replacing arachidonic acid as a starting substrate for eicosanoid production [10].

When suffering vascular cells some damage the platelet aggregation process is triggered, intermediary metabolites omega 3 are less prothrombotic and vasoconstrictors derivatives from the araquidonónico, the fatty acid content in platelets results in the production of thromboxane A2 from the n-6 or thromboxane a3 from the n-3, the latter has a lesser effect aggregating thromboxane A2 reducing the platelet aggregation and thrombosis [11].

A cardiac patient is susceptible to arrhythmias that can cause sudden cardiac death. The proportion of fatty acids in n-3/n-6 in cardiac muscle appears to be related to the risk of sudden cardiac death has been suggested that omega-3 intake may reduce the risk of cardiac arrest by the regulatory effect of omega 3 power transmission in the myocardium [12].

### Omega 3 and triglycerides

The best known effects of omega-3 is the hypolipidemic [13], triglycerides are a risk factor in cardiovascular disease after eating a high-fat meal a characteristic increase in blood triglycerides are known hyperlipemia occurs postpandrial or postprandial response, the intensity of this response is also a risk factor for CVD and is related to the type of fat consumed. Studies indicate that intake of DHA and EPA reduce the postprandial increase in triglycerides [14].

The reducing effect on triglyceride concentrations of omega-3 is due to its ability to reduce the hepatic synthesis of triglycerides and very low-density lipoprotein (VLDL) as EPA and DHA are poor substrates for the enzymes involved in the triglyceride synthesis hindering the synthesis of low density lipoprotein involved in the transport of triglycerides [15].

The ability of omega-3 to increase beta-oxidation of fatty acids by liver peroxisomes cause decrease VLDL synthesis, are capable of inhibiting the enzyme acyl-CoA: aciltrasferasa 1.2-diaglicerol involved in triglyceride synthesis [15].

Also involved in inhibiting the synthesis and secretion of chylomicrons and acceleration postprandial triglyceride clearance.

Several studies show that consumption amounts of fish or fish oils can lower triglyceride levels in healthy and hyperlipidemic subjects.

In most studies it has not detected a significant effect on total cholesterol intake of omega 3, but an increase in HDL produces 10% depending on the food and ingested amounts of omega-3 [10].

### Omega 3 and other cardiovascular risk factors

Hypertension is another risk factor in CVD, this produces endothelial activation which in turn causes endothelial production of adhesion molecules such as ICAM-1, VCAM-1 and infiltration of blood cells to the wall vascular, contributing to thickening of the artery and the development of atherosclerosis [16].

Scientific studies on the ability of omega-3 to stimulate endothelial nitric oxide production [17], this results in relaxation of smooth muscle cells allowing dilation of blood vessels, lowering blood pressure and endothelial activation.

It has been shown that only large amounts of fish, 3 g/day minimum, produce a significant decrease in blood pressure [18].

It is known that diet directly influences the risk factors for these diseases [19].

After analyzing different studies where the consumption of omega 3 and its effect was evaluated, it was concluded that it can favorably affect cardiovascular health, even as small intake.

Some studies such as the "the inverse realtion Between fish consumition and 20-year mortality from coronary heart disease" [20] showed that consumption of 30 g/day of fish reduced the risk of mortality from coronary heart disease by 50% compared to those who did not.

The study "Fish consumption and the 30-year risk of fatal myocardial infarction" [11] found that men who ate more than 35 g/day of fish had a relative risk of mortality from coronary disease of 0.62 compared with those who did not.

The study "Fish consumption and risk of sudden cardiac death" [21] showed that weekly consumption of fish is associated with a relative risk of 0.48 of sudden cardiac death.

The study on "Coronary Atherosclerosis Prevention By Intervention with omega-3 marine origin" [22] showed a reduction in the development of atherosclerosis by administering low doses of PUFA-3 1.65 g/day.

In the study "GISSI-Prevenzione" [23] consumption of a nutritional supplement of PUFA (1 g/day) was decreased by 17% the risk of CVD mortality in relation to the control group that consumed him.

## Omega-3 intake in the population and daily intake recommendations

After analyzing different studies conclude that current consumption of sources of omega-3 is insufficient with respect to the daily recommendations of health agencies.

The approximate consumption of alpha-linolenic in European countries range from 0.6 to 2.5 grams/day. Few data are available about intake of DHA and EPA in Europe [13]. In the study "Polisaturated fatty acids in the food chain in Europe" [24] intake estimated 0.1 to 0.5 g/day. These intakes are high compared to the US (0,1 - 0,2 g/day) but both are small compared to Japan (up to 2 g/day) [25] where the fish is one of the most consumed foods. The omega-3 intake varies from one country to another, from 0,6gr per day from France and Greece to 2.5 grams per day of Iceland. In Spain [26] consumption is relatively low (50 mg/day for a population between 35 and 65 years).

Regarding nutritional intake recommendations omega 3 PUFA international society for the study of Fatty Acids and Lipids (ISSFAL) recommended the amount of 0.65 g/day of DHA plus 1 g/day of alpha-linolenic acid [28].

The new recommendations of the American Heart Association (AHA) are:

People adults: Eating fish at least twice a week

- Patients with heart disease recommended daily intake of EPA + DHA from fish oils or supplements
- Patients with hypertriglyceridemia: supplementation of 2 to 4 grams of EPA + DHA to decrease 20 - 40% plasma triglycerides [26].

The World Health Organization and the Organization for Food and Agriculture in its 2015 report on healthy eating and chronic disease prevention recommend the following fat intakes in relation to the daily intake of fat [28]:

- <10% saturated fat
- Monoun saturated 15-30
- 61% Omega 3.

If the various recommendations of the studies regarding the intake of omega 3 we see that is generally low compared, with the small weekly intake [10] so it is important increased consumption of fish, respecting the recommended amounts [28-30] and treating the species with the lowest percentage of contaminants to ingest the minimum recommended amounts of EPA and DHA.

## Alternatives to increase intake of omega 3

The Spanish Society of Dietetics for a balanced diet recommends increased consumption of food sources rich in omega-3.

The development of functional foods rich in omega-3, can be an alternative for increasing the daily intake. These foods are those which, apart from its nutritional characteristics, are able to perform a specific function, such as improved health and reduction of disease.

The manufacture of a functional food intake omega 3 can be an alternative for increasing the daily intake of omega-3.

An example of the importance and results from the consumption of foods that provide omega 3 is the study by the Institute Puleva health was found that the daily intake of functional milk enriched with omega-3 reduced triglycerides, LDL cholesterol and homocysteine which are considered risk factors in cardiovascular diseases.

## Methodology

Light tuna (Thunnus albacarens) lives in tropical and subtropical seas. The fish is caught with nets and fishing line to be processed in frozen or canned form. For canning, a processed dorsal part stuck to the vane to be the richest part of polyunsaturated fatty acids and proteins (more fish muscle portion) having the highest concentration of omega-3 per gram of product is performed. To this end, the raw material is processed once reaches the factory and packaging natural without added salt or products is performed by different analytical tests before and after cooking to assess whether any contamination or organoleptic variation exists. Tin produced provides a serving of light tuna richer in omega-3 than other commercial cans that can be found in supermarkets. The content is more homogeneous, natural and consistent than the rest of cans.

For the development of human trial will be used at a pilot experimental investigation without control group. We use a quantitative methodology for this study to develop a descriptive model of what happens when you consume canned light tuna for 3 months. Reference are hypolipidemic that interfere with the mechanism of the HMG-CoA reductase, as omega 3 interfere in related lipogenesis [15] enzymes. If indeed the mechanism of action is similar to such drugs and affects lipogenesis night, consumption of omega 3 has to be at night looking for maximum effectiveness on lipogenesis. It also hypothesizes that the contribution of omega 3 to affect metabolic pathways of triglycerides [15].

For the minimum effective hypolipidemic drugs time to consider it is 3 months to achieve remarkable effects because they have a low absorption (about 5% of the ingested dose). The maximum effects are achieved between 2 and 4 weeks of consumption, being necessary at least 3 months to detect significant decreases in lipid values.

An antihypertensive effect by the action of resolvins derived from the metabolism of omega-3, acting on two important risk factors associated with cardiovascular health, such as hypertension and hyperlipidemia [8,9] also hypothesizes.

For the evaluation of its effect, we perform a measurement of blood lipid levels and blood pressure before starting to consume and after the experimental stage right on consumption can last provided to participants.

Participants in the experimental phase can not use other sources of omega 3 nor have changes in drug therapy, as specified in the selection criteria of the sample.

With values obtained statistical analysis is done to study the results of the consumption of canned light tuna and its effects on cardiovascular health.

### Ethical Considerations

Using people in a study can bring positive results for their welfare. Experimental studies are under medical ethics, enshrined in the 1960 Helsinki Declaration adopted by the World Medical Association (which were revised in October 2000). The objectives must outweigh the risks of research, which in this case are minimal since the consumption of light tuna has no negative health effects over a period of time so limited (3 months), and hardly generates allergic reactions your consumption.

### Population and Sample

For the selection of the sample will be used to a type of non-probability sampling setting the following criteria:

#### Inclusion criteria

- Sign the informed consent about the experimental phase
- Be aged between 25 and 75 years
- Present cardiovascular risk factors such as

High levels of blood lipids

- The range of values of the lipid profile
- Total-cholesterol: Values above 180 mg/dl
- LDL-cholesterol: 79 to 189 values mg/dL is considered a high value if carries associated pathology such as diabetes, be over 40 years and present high risk of CVD.
- HDL: Below the desired values (20 and 60 mg/dl).
- VLDL-cholesterol: Levels above 30 mg/dl.

Hypertension pressure of blood vessels above the values considered normal.

They are considered normal in adults:

- 120 mm Hg (systolic) - 80 mm Hg (diastolic).

Participants may submit one or more high to be selected values.

- Belong to the social nucleus will be studied to be extrapolated: living in the geographical area of Galicia in particular in the Atlantic northwest of the Galician coast.

#### Exclusion criteria

- During the duration of the experiment, changing the usual eating habits starting any type of diet.
- Echium fish or other source of omega 3 during the period for which the experimental phase (white fish if allowed).
- Suffering from a physio-pathological situation that could compromise the pilot phase:
  - Morbid obesity, multiple drug therapy that requires continuous revisions to the participant with your specialist.
  - High uric acid levels: Above 8 mg/dl that consumption may affect the can.
  - Suffer from food allergies.

- Not present a normo-term treatment: Pharmacotherapy stable without requiring changes over a period of time longer than 6 months (with no scheduled appointments with primary care physicians or specialists).
- Not keep making the can of the specified time.

### Sample size

Being a pilot test, the sample selection and size (10 participants, 5 men and 5 women with CVD) has been realization considering the section criteria for selection, assuming a representative sample capable of displaying the effect that produced by consuming the can for a long time.

The sample size will allow us daily control participants using different systems, such as control sheets, phone calls and weekly follow-up checks.

### Results

Taking blood pressure is made and the aneroid sphygmomanometer Adult MOD.108M (which is recognized by the Spanish Society of Heart) three measurements are performed with a separation of 10 minutes for the average of the three.

The tensiometer is received new and used during the initiation of the investigation and during the final stage for comparing the readings of the participants.

The calibration is factory and the person doing the readings will be the same to avoid measurement bias.

For lipid analysis take blood samples.

Extracting blood for lipid determination is performed by puncturing necessitating very little (less than 1 ml).

For analysis of blood lipid we employ one Cobas B101 given device, approved and validated by Roche Diagnostics Spain. This device allows the direct application of samples with a single puncture without capillary pipettes for the sample.

This type of measurement meets the standards of precision and accuracy of the National Standardization Program glycated hemoglobin (NGSP) and Cholesterol Education (NCEP).

### Data analysis

The initial and final values after consumption represented in analytical tables.

The analysis of the variation of the initial and final values will allow participants to note the effect of consumption of the can.

For analysis of the results use different software: Windows Office 2016 package, and StatPlus 2 Version 6, 2017 (StatPlus: MacPro).

SatPlus is a software tool that allows us to analyze data using Excell 2016. Basic descriptive statistics Allows performing different test; t-Tests, Pagurova Criterion, G-Criterion, Fisher F-test, Test Pearson, Fechner, D'Agostino's tests.

### Blood pressure

Table 1 shows the initial values of participant´s blood pressure is seen in Table 2 the final results are reported after completion of the experimental phase and Figure 3 and 4 the evolution is being clearly decreasing values of blood pressure relative to the start.

| Previous Study 1 | Systolic | Diastolic |
|---|---|---|
| 1A | 110 | 70 |
| 1B | 105 | 70 |
| 2A | 110 | 70 |
| 2B | 100 | 60 |
| 3A | 130 | 85 |
| 3B | 110 | 70 |
| 4A | 135 | 80 |
| 4B | 130 | 75 |
| 5A | 150 | 85 |
| 5B | 150 | 80 |

**Table 1**: Previous measurements at baseline blood pressure.

| Post study | Systolic 2 | Diastolic 2 |
|---|---|---|
| 1A | 100 | 70 |
| 1B | 100 | 60 |
| 2A | 100 | 60 |
| 2B | 100 | 60 |
| 3A | 120 | 80 |
| 3B | 120 | 70 |
| 4A | 120 | 70 |
| 4B | 110 | 65 |
| 5A | 130 | 80 |
| 5B | 130 | 75 |

**Table 2**: Measures resulting upon completion of the study of blood pressure.

### Lipid profile analysis

Table 3 shows the blood lipid values of the sample before starting the study, Table 4 displays the final results, detecting a clear positive effect on all the values except HDL increases.

**Figure 3:** Blood Pressure variation analysis.

**Figure 4:** Analysis comparative values tension sanguine.

| Analysis 1 previous | Total Chol mg/dl | Triglycerides Mg/dl | Hdl mg/dl | LDL mg/dl | V ldl mg/dl | Non ldl mg/dl | Chol/HDL |
|---|---|---|---|---|---|---|---|
| Part 1A | 273 | 68 | 71 | 188 | 14 | 201 | 3.8 |
| Part 1B | 317 | 116 | 54 | 240 | 2. 3 | 263 | 5.8 |
| Part 2A | 190 | 136 | 37 | 126 | 27 | 153 | 5.2 |
| Part 2B | 186 | 100 | 76 | 90 | 20 | 110 | 2.4 |
| Part 3A | 177 | 138 | 59 | 91 | 28 | 119 | 3.0 |
| Part 3B | 253 | 124 | 66 | 162 | 25 | 187 | 3.8 |
| Part 4A | 118 | 116 | 40 | 55 | 2. 3 | 78 | 2.9 |
| Part 4B | 199 | 183 | 49 | 114 | 37 | 151 | 4.1 |
| Part 5A | 195 | 111 | 54 | 119 | 22 | 141 | 3.6 |
| Part 5B | 189 | 163 | 46 | 110 | 33 | 143 | 3 |

**Table 3**: Lipid results before the start of the pilot phase blood.

| Post study analysis 2 | Chol2 Total mg/dl | Triglycerides 2 Mg/dl | HDL 2 mg/dl | LDL 2 mg/dl | V ldl 2 mg/dl | Non ldl 2 mg/dl | Chol/HDL 2 |
|---|---|---|---|---|---|---|---|
| Part 1A | 250 | 60 | 78 | 160 | 12 | 172 | 3.2 |
| Part 1B | 323 | 86 | 70 | 236 | 17 | 253 | 4.61 |
| Part 2A | 180 | 105 | 51 | 108 | 21 | 129 | 3.53 |
| Part 2B | 175 | 83 | 92 | 66 | 17 | 103 | 2.1 |
| Part 3A | 170 | 92 | 72 | 80 | 18 | 92 | 2.36 |
| Part 3B | 237 | 110 | 71 | 144 | 22 | 166 | 3.4 |
| Part 4A | 111 | 102 | 53 | 38 | 20 | 58 | 2.04 |
| Part 4B | 202 | 135 | 72 | 103 | 27 | 130 | 2.8 |
| Part 5A | 156 | 106 | 52 | 83 | 21 | 104 | 3 |
| PART 5B | 186 | 127 | 68 | 93 | 25 | 118 | 2.7 |

**Table 4**: Final results of blood lipids once the period of consumption of canned tuna.

Figure 5 and 6 show the progression of the value of total cholesterol during the experimental phase, the variation is low because some values increase as HDL.

Figure 7, 8 shows the evolution of triglycerides where a general improvement is seen from the start of the pilot phase to the final phase.

Figure 9 shows the evolution of HDL, which increases blood levels relative to the start of the experimental phase.

Figure 10 shows the initial and final values of LDL, the blue line represents the initial values, final orange appreciate a clear decrease.

Figure 11 muestra evolution VLDL, the blue line representing the initial values of the experimental phase, and the final values orange, exhibiting a general decrease.

Figure 12 shows the evolution of NON LDL.

**Figure 5:** Analysis comparative value of total blood pressure colesterol.

**Figure 6:** Analysis comparative value of total blood pressure colesterol.

**Figure 7:** Triglyceride analysis.

**Figure 8:** Comparative triglyceride análisis.

**Figure 9:** HDL Analysis.

**Figure 10:** LDL analysis.

**Figure 11:** VLDL analysis.

**Figure 12:** Non LDL analysis.

Figure 13 shows the evolution of the ratio Chol/HDL.

**Figure 13:** Analysis Chol/HDL.

## Discussion

The effects of major drug therapies, without using associated active compound combinations, fail in some situations, the reduction obtained after the use of the can for 90 days:

| Pharmacological group | LDLc | HDL - C | Triglycerides |
|---|---|---|---|
| Resins | 15 - 30% | 3 - 5% | ? |
| Statins | 18 - 55% | 05.05% | 7 - 30% |
| Fibrates | 5 - 20% | 10 - 20% | 20 - 25% |
| Ezetimibe | 16 - 20% | 1 - 5% | 02.05% |
| Nicotinic acid | 25% | 14 - 30% | 25 - 50% |
| Statin-ezetimida | 35 - 80% | 10 - 15% | 30 - 35% |
| Statin-fenofibrate | 40 - 45% | 15 - 20% | 50 - 55% |
| Statin-Niacin | 45 - 50% | 30 - 35% | 45 - 45% |

**Table a**

The problem with these therapies are associated with side effects

| Statins | Resins | Fibrates |
|---|---|---|
| Hepatotoxicity | Flatulence | Diarrhea |
| Abdominal pain | Dyspepsia | Gallstone |
| Diarrhea | Constipation | Increased transaminases |
| Constipation | | CPK elevation |
| Migraines | | Myositis |
| Insomnia | | Impotence |
| Exanthema | | Dermatologic Disorders |
| Pruritus | | |
| Myopathy | | |

**Table b**

Clearly, the treatment of choice is non-pharmacological, except severe vascular risk situations. The previous use of a source of omega 3 can be a real alternative to avoid the onset of drug therapy.

Also put in place drug therapies, as occurred in some participants of the sample, the daily supplement of a tuna increase the contribution of omega 3 gets significant decreases, making it an alternative reinforcement to improve lipid levels blood.

## Conclusions

Using a can of tuna as a source of omega 3 has beneficial effects on health. Using a can of tuna developed as a functional food, which interferes with nocturnal lipogenesis, it can be considered as an alternative support for the treatment of hyperlipidemia improving cardiovascular health and increasing the daily intake of omega3.

Blood pressure seen an improvement, lowering systolic values, and more moderately diastolic, showing an improvement. This reduction means less risk associated with cardiovascular disease, because all participants present values considered healthy (within the parameters set by the international community) after the experimental phase but mainly a stabilization of values is observed.

Lipid profile a general decrease, especially the values of VLDL triglycerides and appreciated.

In participants with congenital hypercholesterolemia seen a different variation in LDL (participant 1A and 1B) that makes us simply assume that their involvement can information be related LDLR gene location 19p13.2.

The remaining values a significant and sufficiently representative to account decrease seen. Participants with congenital hypercholesterolemia elevated total cholesterol value is maintained, but have an increase of about 10% of HDL which may affect this increase.

The widespread increase in HDL confirms that canned tuna is a source of omega-3 capable of raising the values of this lipoprotein in blood by consumption.

Decreased lipid levels in blood, and the associated increase in HDL, it suggests that eating a can of tuna developed as a functional food improves cardiovascular health by reducing risk factors associated with cardiovascular disease as are the hyperlipidemia and hypertension.

## Bibliography

1. World Health Organization. Global status report on noncommunicable diseases (2010).
2. SS Lim., *et al*. "A comparative risk assessment of burden of disease and injury attributable to risk factors and 67 risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010". *Lancet* 380.9859 (2012): 2224- 2260.
3. Last AR., *et al*. "Pharmacologic treatment of hyperlipidemia". *American Family Physician* 84 (2011): 551-558.

4. The British Nutrition Foundation. Diet and heart disease, a round table of factors". Second Edition, Chapman and Hall, London (1997).
5. E Juana and Juana JR. "Seafood guide current consumption in Spain". *Ediciones Omega SA Barcelona* (1987).
6. Albert CM., *et al*. "Fish consumption and risk of sudden cardiac death". *Journal of the American Medical Association* 279 (1998): 23-28.
7. Mckee T and Mckee JR. "Biochemistry: the molecular basis of life". SA MCGRAW-HILL / SPAIN INTER (2003).
8. HF Chung., *et al*. "Association of n-3 polyunsaturated fatty acids and inflammatory renal function indicators With decline in type 2 diabetes". *Clinical Nutrition* (2014).
9. Christensen Jeppe Hagstrup., *et al*. "Heart rate variability and the fatty acid content of red cell membranes: a study of dose response with n-3 fatty acids". *American Journal of Clinical Nutrition* 70 (1999): 331-337.
10. British Nutrition Foundation. Report of the British Nutrition Foundation's Task Force. N-3 fatty acids and health. The British Nutrition Foundation. Chapman and Hall". New York and London (1999).
11. Daviglus ML., *et al*. "Fish consumption and the 30-year risk of fatal myocardial infarction". *The New England Journal of Medicine* 336 (1997): 1046-1053.
12. Siscovick DS., *et al*. "Dietary intake and cell membrane levels of chain n-3 fatty acids and the risk polyinsatured of primary cardiac arrest". *Journal of the American Medical Association* 274 (1996): 1363-1367.
13. Libby P., *et al*. "Progress and challenges in translating the biology of atherosclerosis". *Nature* 473 (2011): 317-325.
14. Adler AJ and BJ Holub. "Effect of garlic and fish-oil supplementation on serum lipid and lipoprotein concentration in hypercholesterolemic men". *The American Journal of Clinical Nutrition* 65 (1997): 445-450.
15. Katan M and Mensink R. "Isomeric fatty acids and serum lipoproteins". *Scandinavian Journal of Nutrition* 26 (1992): 46-48.
16. British Nutrition Foundation. Unsaturated fatty acids: nutritional and physiological significance: the report of the British Nutrition Foundation's Task Force / The British Nutrition Foundation. London; New York: Published by Chapman and Hall for the British Nutrition Foundation (1992).
17. Burr ML., *et al*. "Effects of changes in fat, fish, and fiber intakes on death and myocardial Reinfarction: diet and trial Reinfarction (DART". *Lancet* 2 (1989): 757-761.
18. Appel LJ., *et al*. "Does supplementation of diet with "fish oil" reduces blood pressure? A meta-analysis of controlled clinical trials". *Archives of Internal Medicine* 153 (1993): 429-438.
19. AJ lusis. "Atherosclerosis". *Nature* 407 (2000): 233-241.
20. Kromhout D., *et al*. "The inverse relation Between fish consumption and 20-year mortality from coronary heart disease". *The New England Journal of Medicine* 312 (1985): 1205-1209.
21. Albert CM., *et al*. "Fish consumption and risk of sudden cardiac death". *Journal of the American Medical Association* 279 (1998): 23-28.
22. Von Schacky C., *et al*. "The effect of n-3 fatty acids on coronary atherosclerosis: results from SCIMO, an angiographic study, background and implicaciones". *Lipids* 36 (2001): 99S-102S.
23. Hopper L., *et al*. "Ebrahim GISSI-Prevenzione trial". *Lancet* 354 (1999): 447-455.
24. Sanders TA. "Polyunsaturated fatty acids in the food chain in Europe". *The American Journal of Clinical Nutrition* 71 (2000): 176S-180S.
25. European Food Safety Authority. "Panel on Dietetic Products, Nutrition and Allergies. Scientific Review Tolerable Upper Intake on the Level of eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA) and docosapentaenoic acid (DPA)". *The EFSA Journal* 10.7 (2815): 48.
26. Kris-Etherton PM., *et al*. "American Heart Association: Omega-3 fatty acids and cardiovascular disease: New Recommendations from the American Heart Association". *Arteriosclerosis, Thrombosis, and Vascular Biology* 23 (2003): 151-152.
27. Amiano P., *et al*. "Very-long-chain omega-3 fatty acids as markers for usual intake fish in a fish population consuming mainly read: the EPIC cohort of Gipuzkoa. (2001). European Prospective Investigation into Cancer and Nutrition". *European Journal of Clinical Nutrition* 55 (2001): 827-832.
28. Simopoulos AP., *et al*. "Essentiality of and recommended dietary intakes for omega-6 and omega-3 fatty acids". *Nutrition and Metabolism American* 43 (1999): 127-130.
29. World Health Organization.Healthy food. Simple note. WHO Library Cataloging-in-Publication Note Simple (2015).
30. Stanley JC., *et al*. "UK Food Standards Agency Workshop Report: the effects of the dietary n-6: n-3 fatty acid ratio on cardiovascular health". *British Journal of Nutrition* 98.6 (2007): 1305-1310.