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**AN EBOOK ON
VASCULAR DISEASES**

Dietary protein supplements and prevention of cardiovascular disease and metabolic disorders

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Introduction

Dietary supplements are referred to a manufactured product which supplements the diet taken by mouth as pill, capsule, tablet or liquid. Dietary proteins are the main source of active and healthy lifestyle. While exercise is mostly recommended, good diet is always a plus point which prevents a lot of diseases. Intake of dietary fiber and protein are probably important contributors to the development of the preventive strategies [1,2]. Most exciting advances are occurring in the area of dairy including milk, yogurt and cheese. Many other ingredients and mechanistic pathways clarify both the ingredients and the pathways for diet influencers on health and well-being. Cardio metabolic diseases such as heart disease, stroke, type 2 diabetes mellitus are majorly caused by the poor dietary habits [3]. United states among all other countries estimated to have 1000 deaths each day with poor diet which caused cardiometabolic deaths [4]. These supplements are extracted from food sources, synthetically can provide nutrients to increase the quality of their consumption. There are rules for food supplements to ensure their safety and label by European Commission [5].

Abstract

In this day and age the most pressing problem is the lifestyle of people which is leading to multiple fatal diseases. Cardiovascular disease is one such disease which is caused mostly because of the poor lifestyle. Healthy lifestyle which includes a healthy diet is very important. In order to preserve physical function during aging proper nutrition and especially protein intake is necessary. The best strategy to support physical performance in old age is consuming animal-derived protein. Optimal protein intake and nutrition are compulsory to sustain physical function during aging. Exhaustive dietary change is necessary to get the impact of nutrients on physical performance in geriatrics. Operational studies for future are required to get the right mixture of protein sources to support physical performance in old age. Physical activity and healthy dietary habit have beneficial effects, exercise and dietary plans increase positive health-related changes. Through this review our main objective is to throw light on to role of dietary protein supplements in the prevention of cardiovascular diseases and metabolic disorders.

Amino acids are the building blocks for the muscle growth which are provided by the proteins. Dietary supplements supply all the amino acids which our body can't make on its own. Enough dietary proteins are important because your body doesn't store it the way it stores fats and carbohydrates.

Those ready-to-drink and powders to be mixed into the water protein supplements are marketed to aid people's illness or injury, people preventing the sarcopenia of old age [6,7] athletes with vigorous physical training require proteins [8] people trying to lose weight by minimizing muscle loss i.e. conducting the protein-sparing modified fast [9]. The most popular ingredient is the whey protein [7,10,11] although products may contain casein, soy, hemp, pea or rice protein.

U.S and Canadian Dietary Reference intake guideline says that, 0.8 grams proteins per kilogram body weight for adults according to the protein Recommended Dietary Allowance (RDA). This for those are lightly active [12-14]. High protein diet combined with exercise increases muscle mass results by scientific



reviews [15-17]. Protein intake helps for both strength and enduring athletes at 1.2-1.8 g/kg body mass per day recommended by International Olympic committee [18]. Approximately 25% of daily protein should be taken for energy requirements, i.e., approximately 2.0 to 2.5 g/kg [20].

These protein ingredients can be added into the meal replacement and medical food products as dietary supplements, although are regulated and labeled differently from supplements. Meal replacement products are foods containing protein, carbohydrates, fats, vitamins, minerals in the United States. There are few contents which are claimed as "good source of protein", "low fat" or "lactose free" [21]. Physicians and other health care professional give their patients' medical foods, also nutritionally complete [22,23].

Amino acids are the building blocks of proteins. Among them nine proteinogenic amino acids which are essential because they cannot be produced by other compounds in the human body and therefore should be taken in as food. Intakes recommended are milligrams per kilogram of body weight per day are established [24]. Amino acids are also sold as dietary supplements individually and in combinations. These amino acids are supplemented with the branched chain amino acids leucine, valine and isoleucine for stimulating muscle protein synthesis. This claim was unwarranted in one of the literatures reviews [25]. Supplementation with leucine resulted in 0.99kg increase in elderly people with lean body mass [26]. In the synthesis of nitric oxide (vasodilator) non-essential amino acid consumed sufficiently acts as a donor. Confirmed blood pressure lowering by a review [27]. The popular dietary supplement for sports performance taurine not an amino acid technically. Cysteine an amino acid in the body synthesizes it [28].

Proteins are the macronutrients found in many foods. There are a lot of benefits of proteins like healthy hair and nails including building muscle and tissue. People can find protein in foods other than food supplements such as beef, fish, eggs, dairy products, seeds, nuts, and legumes. Protein supplements makes it easier for those amino acids which we don't get from the food we eat.

Protein supplements classification

Protein-concentrate vs. Isolate: Protein can be derived from various food sources and "concentrated" by removing the non-protein parts. Result: powder which is 70 to 85 percent pure protein (with the remaining 15 to 30 percent mostly of carbohydrates and fat). In the further step of concentration, non-protein content is mostly removed by "isolation". A premium protein is yielded by this process that is up to 95 percent pure.

Complete vs. Incomplete protein: Amino acids not produced by the body are known as essential amino acids. All nine essential amino acids could be found in "complete proteins", whereas "incomplete proteins" contain only few, not all, of the essential amino acids.

Diet and cardiovascular diseases

Cardiovascular disease is also known as heart disease. CVD generally is condition in which the blood vessels contracts or gets blocked leading to heart attack, stroke or chest pain (angina).The term cardiovascular disease usually means damaging of blood vessels or heart by atherosclerosis which is a type of condition in which fatty plaques builds in your arteries. This building up of plaque thickens and coagulates artery walls thus

inhibiting the blood flow through arteries to organ organs and tissues. It is the cause of highest mortality and morbidity rates. Non-communicable diseases such as cardiovascular diseases are major causes of mortality in many developing countries. Diet rich in cholesterol and saturated fat has the main effect on people which leads to heart diseases because they cause the clotting of the blood. Sodium rich diet usually increases the blood pressure. Too much alcohol consumption causes high B.P which is responsible for the cardiovascular diseases. Fortunately, these Cardiovascular (CV) are preventable or could be delayed later in old age reducing events, morbidity, disability, and sanitary costs. Initiation of early prevention would be effective against onset and development of disease, and reduces other adverse events [29]. CV risk factors occurs from early ages, thus this healthy diet strategy must be started and adjusted throughout the life of an individual. 17.5 million people died because of CVD in the year 2012 which is approximately 31% of death globally according to World Health Organization report [30]. Annually 4 million people die because of CVD in countries like Europe. The deaths related to CVD are expected more than 23.6 million, globally, and because of increased incidence of disease by 2030 [31]. Epidemiological studies documented progression of various risk factors of cardiovascular disease [32]. Fetal life, and neonatal physiology together with childhood and adolescence are all critical phases for the development of Cardiometabolic Risk (CMR) and later onset of atherosclerosis, hypertension and diabetes [33]. Dietary soy protein significantly decreased the concentrations of total cholesterol, LDL cholesterol, and TG compared with animal protein, primarily casein. They furthermore concluded that the percent of LDL cholesterol lowering was greater with increasing initial LDL cholesterol concentrations. Potentially confounding these observations was the presence or absence of bioactive compounds retained in the soybean after processing.

Metabolic disorder

When abnormal chemical reactions in the body alter the normal metabolic process causes metabolic disorder [34]. It is also known as an autosomal recessive an inherited single gene anomaly [35].

Symptoms of metabolic disorders are lethargy, weight loss, jaundice and seizures. Symptoms also vary depending on the type of metabolic disorder. The four categories of symptoms are acute symptoms, late-onset acute symptoms, progressive general symptoms and permanent symptoms.

Clumps of Cardiovascular Disease (CVD) risk factors characterizes the metabolic syndrome MetS, as they increase in number the severity increases too, and the risk of type II diabetes, CVD, and causes mortality [36,37]. Weight loss for abdominal obesity, healthy dietary pattern, and regular exercises are recommended for the treatment of MetS [38]. Weight loss of 5-10% improves blood glucose, triglycerides, and Blood Pressure (BP), HDL cholesterol and LDL cholesterol [39]. Since weight loss process is very gradual and challenging one for many, a good dietary pattern can improve MetS without effecting weight loss could be beneficial in affecting the MetS risk comorbidities. Dietary approach to stop hypertension (DASH) a dietary pattern is suggested for LDL cholesterol and BP lowering [35]. DASH dietary pattern decreases BP [40] and LDL cholesterol [41,42] more compared to a controlled diet which was of protein and high in total fat and saturated fatty acids SFAs. Diets low in SFAs and high in unsaturated fat or protein improves BP and also is beneficial in affecting HDL cholesterol and triglycerides,

which are usually affected by a lower fat/higher carbohydrate diet [43]. DASH supports cardiovascular benefits consisting of a plant-based diet, and also emphasized plant protein [35]. DASH dietary pattern has quantities of animal protein from seafood, reduced-fat, dairy products, and white meats, and albeit it's increases, the plant protein contribution to overall protein is proportionally less [44].

There are various kinds of protein supplements made from different sources which are listed in the table 1.

Preventive guidelines for cardiovascular diseases and metabolic disorders

Prefer the healthy sources of protein

Almost every type of food contains protein. They just vary in the quantity. Eating meat is not compulsory to get protein, you get it from your diet. Protein-rich contains many other nutrition. For example, in order to reduce saturated fat, you'll go for lean pieces of meats over fattier pieces. And to reduce sodium, you should skip the meats are processed like sausage and hot dogs. The daily recommended of sodium consumption is 2400 milligrams per day. Although as per the American Heart Association, people with high blood pressure should consume less than 1500 milligrams a day, or not more than ¼ tablespoon of salt. Ensure to avoid canned foods, replace salt with spices and herbs, and avoid pickled foods, choose low-sodium cheeses.

Choose tuna, salmon, or eggs which are fortified with omega-3s to get more amount of omega-3s. Flaxseed and canola oil are high in omega-3 along with eggs, soybeans, wild rice. Beans, nuts, vegetables, and legumes for fibre is recommended. To prevent the chance of heart disease, limit the consumption of red meat, especially those processed red meat, and rather go for more fish, beans, and poultry, suggested by the Harvard School of Public Health researchers. Researchers and nutrition experts recommend to opt from a variety of protein sources. For weight management include protein with every meal. It helps you feel fuller for a longer time. Even spreading of protein across your meals helps your muscles, which is important as you get older you would lose muscle mass [50,51].

Limit fats which are unhealthy

Saturated and trans fat reduction is the first and an important thing in order to prevent blood cholesterol and risk of diseases like coronary artery diseases. High blood cholesterol which increases the plaque in arteries risks the chances of stroke and heart attack.

There are kinds of fat which should be avoided and taken in particular amount to maintain your diet and these are listed below in a table 2.

Table 1: Types of proteins and their pros and cons

S.No	Types of protein supplements	Mechanism of action	Advantages	Side effects	Daily dietary intake	References
1	Whey protein	These whey proteins are rich in Branched Amino Acids (BCAA) isoleucine, leucine, and valine which affect the glycemic response indirectly. It reduces 24-h AMBP, which improves vascular function, and other cardiometabolic risks. This happens when it is consumed with Carbohydrate (CHO) which causes the digestion rapid and thus releases amino acids.	Promotes in building muscles and fat loss. Quick absorption by the body makes useful for post workout recovery. Supports cardiovascular diseases and healthy metabolism.	Whey is indigestible for some because the milk (lactose) have sugar which is a common allergen.	0.8g	45
2	Casein protein	Casein forms into gels which is quite unique. Casein converts into gel once it comes in contact with the stomach acids during digestion. Thus, reducing the digestion rate and allowing slow, effective release and utilization of casein's amino acids. Burning of amino acids for energy	Casein takes time to digest. And so, it is favourable protein choice for before the bed time. Increasing the intake by 2.5 times metabolic rates increases while sleeping and also helps in reducing fat, thus helps in preventing diseases like cardiovascular diseases.	Allergenic for some people. And also, expensive than whey, for making it more palatable many artificial ingredients are added. Causes bloating, heartburn and Acidity	0.36g	46
3	Egg protein	Eggs contain 212mg of cholesterol. They actually improve the cholesterol levels. They raise the HDL (good) cholesterol as well as increases the LDL particles size which are less harmful than the small ones. thus, helping in preventing the heart diseases	The egg protein is one the good source of protein. Including the protein these contains vitamins and minerals which is good for a healthy diet. It also protects from cardiovascular diseases. Lowers LDL cholesterol, promotes weight loss, good for strong bones.	These are also allergic which is common, like milk allergies, especially in children and young adults ⁴⁷ . Also, one of the most expensive protein supplements.	0.8-1g	46

4	Soy protein	Soy proteins contains fibre and has no cholesterol. Also low in saturated fat. Meta-analysis states that soy phytoestrogens- the genistein, daidzein and isoflavones reduces serum cholesterol levels.	Soy protein and isoflavones helps in improving cardiovascular diseases. And also decreases LDL concentrations, improves immune functions and promote bone health and helps in reducing certain cancer.	Recently, being genetically modified to produce greater crop soy yields has come under heavy scrutiny. Due to its effects on hormone levels some research has singled out soy.	7-10g	47
5	Rice protein	Rice protein improves lipid levels and adiposity. They interfere with enterohepatic circulation which leads an inhibition of hepatic secretion into circulation of lipids which is associated which lipoprotein production and lipogenesis. Rice protein lowers the assembly of VLDL and secretion suggested by Yang et al which results in decrease of hepatic secretion of cholesterol and triglycerides into circulation hence hypertriglyceridemia and hypercholesterolemia	Brown rice protein is also considered to be a good source of complex carbohydrates, vitamin B, and fibre not just the proteins. It's also consumed entirely by the body making it hypoallergenic, which means it's easily digestible and therefore, does not relieve as waste.	Deficient in some amino acids unlike soy, rice protein is a plant-based option and therefore the main source of dietary protein should not be comprised.	300-450g	1. 47, 2. 48
6	Hemp protein	These hemp proteins are popular because these are derived from the seeds of the cannabis plant. In "The black book of Hollywood pregnancy secrets" Kym Douglas noted that these hemp seeds are weight loss helper. These hemp seeds have omega-3 EFA which increases satiety	"Superfood" due to its mixture of essential fatty acids, it is vegan friendly and hypoallergenic too.	Only harvested in mass quantities in selected countries because it is associated with cannabis, often the most expensive one.	46-56g	48
7	Pea protein	Extracted from the yellow split pea, makes it a popular choice for vegetarians and vegans alike. Pea protein increase the satiety levels CCK and GLP-1 hormones ⁵⁴ . Pea protein acts as thermogenic agent which increases heat in body which burns calories.	Being a plant-based protein, pea protein is hypoallergenic too. It's the most appealing one with few additives or artificial ingredients, to those looking for protein sources closest to the whole-food source.	This isolated pea protein contains spectrum of essential amino acids considered complete. Still, remains deficient in some amino acids and not to be used as a primary source of dietary protein.	20g	49

Table 2: Guidelines for fat consumption quantity by the American Heart Association for heart-healthy diet

Types of fat	Recommended quantity
Saturated fat	In total only 5 to 6% of daily calories, for those following 2000-calorie-a-day diet should consume 11 to 13g saturated fat only
Trans fat	Should be avoided

Choose mono saturated fats such as canola oil or olive oil in case you are using fats. For a healthy heart the diet should contain polyunsaturated fat which are present in avocados, fish, seeds and nuts. Replace saturated fat with monounsaturated and polyunsaturated which is going to help in reducing total blood cholesterol. Although moderation is important. Any kind of fat is high in calories.

Some other additional guidelines are as follows:

Nutritious food: Skip foods that are not nutritious and are high in calories. Go for other options if food is saturated and has trans-fat.

Right food options for protein: Limit the amount of red meat consumption if you are at risk of heart disease, and try for the right source to get protein like from poultry, fish and nuts. The omega-3 fatty acid helps in lowering the risk of coronary artery disease.

Avoid sugar consumption: Sugary beverages should be reduced like soda or juices. Limit the number of sugary beverages like juice or soda. The added sugars in desserts, candy, yogurt and cookies does not provide nutrients to the body and add are rich in extra calories.

Check for calories: Calorie consumption per day should be counted to maintain a healthy weight. More calories consumption more should be the physical activity.

Eat healthy: Diet rich in fruits, vegetables, lean meats, vegetables, and skinless poultry and fat-free dairy products or low-fat. Processed foods which are high in saturated and trans fats, added sugar and sodium should be avoided.

Exercise: Start by walking and add at least 150 minutes of moderately vigorous exercise into your weekly routine. Experiment, by trying something else you would enjoy doing that gets your heart rate up. If needed, take short breaks, sessions

throughout the day to reach your goal.

Conclusion

The vast diversity of ingredients and mechanisms which helps food influencing health has been clarified by the modern nutritional science. Studies focusing on the effects of dietary protein on the CVD are difficult to possess and they also can't explain the protective role of proteins from veggies which have been initially reported from observational studies. Intervention studies focused on exploring the soy protein lipid lowering potential. Earlier work suggests a beneficial effect of soy protein on lipoproteins and plasma lipids, studies provided few promising results recently. Soy protein effects on cholesterol-lowering were consistent, although small, soy protein compared with animal sources of protein other than casein. Soy protein effects of soy protein on other CVD risk factors are, reportedly small. Displacement of animal protein with vegetable protein have beneficial effect on CVD risk, the majority of the benefit is likely attributable to a shift in the fatty acid profile of the diet favouring unsaturated fatty acids. The intake of these dietary protein supplements is fruitful comparing to its effects if taken in right amount would prevent and cure many diseases at the same time.

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