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Potential Benefits and Threats Arising from a Plant-Based Diet

Korzyści i zagrożenia wynikające ze stosowania diety roślinnej

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Abstract: A plant-based diet is a type of diet gaining more and more popularity. It is a elimination diet excluding all animal products and by-products. There are many reasons for switching from a traditional diet to a plant-based diet. This paper focuses on the four most prevalent reasons for switching diet: economical, health-related, ethical and ecological. The potential benefits and threats of a plant-based diet are also presented.

Keywords: plant-based diet, vegan diet, vegetarian diet.

Streszczenie: Dieta roślinna zyskuje coraz większą popularność. Jest to rodzaj diety eliminacyjnej, co oznacza, że wyklucza ona wszystkie produkty pochodzenia zwierzęcego oraz produkty uboczne powstające przy produkcji odzwierzęcej. Istnieje wiele powodów przejścia z diety tradycyjnej na dietę roślinną. W niniejszym artykule skupiono się na czterech najbardziej powszechnych przyczynach zmiany sposobu odżywiania – ekonomicznym, zdrowotnym, etycznym i ekologicznym. Przedstawiono również potencjalne korzyści i zagrożenia wynikające ze stosowania diety roślinnej.

Słowa kluczowe: dieta roślinna, dieta wegańska, dieta wegetariańska.

1. Introduction

A diet means a particular nutrition system involving quality and quantity of food adjusted to one's nutritional needs. The diet should provide an adequate amount of protein, carbohydrates, fats, minerals and vitamins. It also should provide a sufficient

energy level corresponding to one's activity level (*Wielka Encyklopedia Oxfordu*, 2008). A Plant-based diet is an example of a special diet, i.e. it renders all the essential nutrients, but at the same time it restricts the intake of certain types of food.

Vegetarian and vegan diets are types of diets that severely limit animal products and increase the consumption of plant-based food.

Vegetarian diets require the elimination of all meat products. The staple foods of the vegetarian food pyramid are whole grain, legumes, unprocessed vegetables and fruit, edible mushrooms and nuts. Vegetarian diets can be divided into lacto-ovo-vegetarian and vegan. Moreover, lacto-ovo-vegetarian diets can be further divided into:

- lacto-vegetarianism – excludes eggs but allow dairy consumption,
- ovo-vegetarianism – excludes dairy products but allow egg consumption,
- raw foodism/rawism – excludes all products that have been heat-treated. It allows only unprocessed fruit and vegetables,
- lacto-ovo-pesco-veganism – allows fish, dairy and eggs, excluding meat and animal by-products,
- semi-vegetarianism – allows eggs, dairy, poultry, fish and seafood, excludes red
- fruitarianism – allows the consumption of fruit and vegetables that have not been picked by man or machines,
- pollo-vegetarianism – allows poultry, excludes fish and mammal meat,
- flexi-vegetarianism – allows sporadic meat consumption, the main source of protein is plant-based (Cader and Lesiów, 2021; Reguła, 2013).

A vegan diet is deemed to be the most restrictive among vegetarian diets. In English scientific literature “vegan diet” is mostly replaced by the more scientific term “plant-based diet”. The term means a diet which consists of only from products that are plant-based. The staple foods of plant-based/vegan diets are legumes, seeds, cruciferous vegetables, whole grain and fruit (Venti and Johnston, 2002; www.aicr.org).

A Plant-based diet constitutes the complete exclusion of animal products such as: meat, offal, dairy, eggs, honey and edible animal by-products such as gelatin, thus it consists only of products made of plants (www.forksoverknives.com).

A vegan diet and plant-based diet are often misrepresented in popular culture. The dieting conditions are the same, however the reasons for excluding animal products are different. People following plant-based diet due to ethical reasons usually call themselves vegans. They usually extend their plant-based philosophy to other daily aspects such as the exclusion of cosmetics tested on animals, clothing made of leather or fur, as well as other items made of animal by-products.

Those who follow a plant-based diet, but continue to acquire products made of leather or fur, do not refer to themselves as vegans. The general assumption is that everyone who call themselves vegan will follow a plant-based diet, but not everyone who daily follows a plant-based diet will extend these principles to their daily lifestyles. Most of the time, a plant-based diet omits the ethical reasons behind the diet.

The objective of this article was to present the most popular conditions of a plant-based diet, as well as show all the potential benefits and threats arising from a plant-based diet.

2. Indications and contradictions to dieting

People suffering from chronic illness are recommended to seek medical advice or consult a dietician in order to diagnose any indications and contraindications regarding changes in their current diet. Examples of such contraindications include abnormal body weight, putative cardiovascular diseases development, avitaminosis or hypervitaminosis. A very similar attitude is generally recommended for healthy people who are slightly overweighted.

WHO published general recommendations regarding healthy lifestyle, according to which it is beneficial for adults to:

- consume fruit, vegetables, legumes, nuts and whole grain on a daily basis,
- the daily amount of fruit and vegetables should constitute up to 400 g, excluding root crops,
- limit daily sugar intake (50g/day) including free sugars and sugar found in food,
- limit daily fat intake (less than 30% of overall calorie requirement) unsaturated fats are preferred,
- limit daily salt intake to less than 5 g per day. Iodized salt is recommended (www.who.int).

In line with the WHO's recommendations, the overall daily food consumption should comprise up to 55-75% of carbohydrates, 15-30% of fat, 10-15% of protein, at least 14 g of fibre for every 1000 calories consumed (Olszanecka-Glinianowicz, 2012). According to One Planet Food Programme, meat should be deemed as a side dish and not the main course.

British nutritional organizations recommend that meat should constitute up to 4% of daily food intake, fruit and vegetables should account for 35%, and grain products (including potatoes) should comprise of 29% (Rejman et al., 2015).

Main contraindications to dieting are food allergies and/or food intolerances. These illnesses affect nearly 20% of all the populations in developing countries (Frank, Szachta, Gałęcka, and Ignyś, 2014).

3. A plant-based diet

3.1. Fundamentals, assumptions and conditions of following a plant-based diet

A plant-based diet relies on the consumption of products made only from plants and the exclusion of meat products.

Products consumed in a plant-based diet are fruit, vegetables, legumes, seeds and nuts. Products excluded from a plant-based diet are meat, dairy products, eggs, honey, offal and also animal by-products such as gelatine.

The four main aspects regarding a plant-based diet are:

- economic,
- health-related,
- ethical,
- ecological.

The reasons behind switching from a traditional to a plant-based diet can vary from person to person. Economic, health-related and ecological conditions are more “flexible” than those ethical.

People following a plant-based diet due to the above reasons can sometime “break” from the diet and might not always discontinue the procurement of products tested on animals or containing animal by-products. The economic reasons mostly relate to the potentially saved money.

These reasons can be voluntary as much as ‘forced’ by external factors. When it comes to quick ways to save money, fast food is the most convenient, nevertheless it is the most nutrient-deprived type of food.

Far-reaching economic perspective is focused on the potential reduction of medical costs. A well-balanced plant-based diet allows to potentially reduce the medical costs of putative illnesses related to leading an unhealthy lifestyle. It can be seen as an ‘investment’ into one’s future healthy life without any necessary pills or/and tablets (Greger, 2018).

Following a plant-based diet due to its ethical reasons is firm and restrictive. Most of the time, the consumption of any animal food or animal by-product is unacceptable. The withdrawal from meat and animal product consumption is also followed by strict exclusion of the procurement of products that might have been tested on animals or contain any animal by-product. The main reason behind this type of behavior is the fact that animals can feel pain, anxiety and fear as much as people.

The ethical reasons are mostly focused on speciesism – a philosophy regarding the treatment of individuals of different species. For example: *Rattus norvegicus* also known as Brown Rat or Common Rat, is seen as an undesirable pest by most people, however when the same Common Rat lives at home it is seen as a sweet pet (Brylla, 2018). For people following a plant-based diet due to ethical reasons, animal welfare is among the most frequent reasons for adopting it (Cader and Lesiów, 2020).

A vegetarian diet due to ethical reasons is prevalent among the Buddhist community, especially in India and China (Cader and Lesiów, 2021).

The ecological reasons behind switching from a traditional to a plant-based diet are focused mostly on animal products and by-products due to its impact on deforestation. The global deforestation problem has been well-publicized over the last decade. Clearing forests for grazing, egg and dairy production as well as animal feed productions is the main reason for deforestation.

Meat production is one of the crucial reasons for Earth's natural resource depletion, eutrophication and climate change. Livestock production accounts for methane, nitrous oxide, and carbon dioxide emissions, all of which are responsible for global warming (Djekic, 2015). Livestock production is also correlated with one-fifth of all GHG (*greenhouse gases*) (Eshel, Shepon, Makov, and Milo, 2014). Another problematic aspect of livestock production is the usage of water; approximately 27% of the Earth's water resources are used on animal production only roughly 4% of the resources are used in households (Mekonnen and Hoekstra, 2012).

Deforestation is also connected with the reduction of biodiversity. In the last ten years, 52% of wildlife have been eliminated due to clearing forests for animal production. Half of the surviving bird species are threatened by complete extinction (Stoll-Kleemann and O'Riordan, 2015).

Health-related reasons can be usually divided into a withdrawal from the consumption of meat products, and the avoidance of dairy or eggs. Usually health-related reasons do not include the exclusion of gelatin or beef tallow (Greger, 2018).

3.2. Benefits and threats arising from a plant-based diet

A plant-based diet, just like any other elimination diet, results in threats and benefits. These stem from the limitation or withdrawal from the use of specified products, which leads to their necessary replacement. The impossibility of finding an adequate substitute considering macro and micro elements creates the risk of malnutrition, nutritional deficiency and disability. There are many different and contradicting opinions about the amount and type of products one needs to consume for a correct nutrition of one's body. This could make a plant-based diet seem as exaggerated, cumbersome and dangerous.

The fear of various diseases and illnesses such as anaemia is justified. Many vitamins and nutrients come directly from animal products and cannot be found in many easily-accessible plant foods, which might not be readily accessible at stores in a particular geographical region and might be over-priced, and thus unavailable for most people. According to WHO data, approximately 47% of children below the age of 5 suffer from anaemia, 50% of these cases are related to iron deficiency (Gashu et al., 2015).

Verlyn Yang et al. (2020) described a case of a woman following a plant-based diet suffering from central retinal vein occlusion, resulting from an iron-deprived diet. As a result she decided to include red meat in her diet. Iron originating from animal products is absorbed more efficiently than iron of plant origin.

However, another study conducted in 2015 among Ethiopian children (n = 628) showed low iron deficiency level, despite the prevalently plant-based diet among the children being tested (Gashu et al., 2015). Another study conducted in Ethiopia in 2019 has also demonstrated low iron deficiency (Seyuom, Humblot, Nicolas, Thomas, and Baye, 2019).

A study conducted in Indonesia among Sundanese adolescent girls ($n = 176$) demonstrated prevalent anemia caused by iron deficiency. The daily diet of these girls mostly consisted of plant-based products (Rahfiludin, Humblot, Nicolas, Thomas, and Baye, 2021). According to an article from 2019, women suffering from iron deficiency ($n = 118$) had their cognitive functions hampered and weakened. However more study is required to address this statement (Medawar, Huhn, Villringer, and Witte, 2019).

One of the potential dangers of a plant-based diet is the overconsumption of food imitations of meat and/or dairy. Thus type of foods often contain salt, processed sugar, preservatives or artificial food colours (Greger, 2018).

3.2.1. Benefits arising from plant-based diet

One of the most crucial benefits arising from a plant-based diet is the reduction of LDL (the so-called: bad cholesterol), which is often found in animal products and their by-products, but usually cannot be found in plants. The average cholesterol content in beef constitutes up to 58 mg%, in pork – 65 mg%. Fresh meat contains between 43 mg% and 68 mg% of cholesterol. However up to 15% of total cholesterol content can be ‘removed’ by cooking or roasting the meat (Greger, 2018).

According to the *American Institute for Cancer Research*, a well-balanced diet can help lower the risk of developing cancer. AICR defines a well-balanced diet as one containing mostly whole plant-based products. A diet rich in various nutrients, minerals and vitamins is crucial for a healthy life-style (www.aicr.org).

A study conducted among 30 thousand postmenopausal women, who never developed breast cancer demonstrated that the following three AICR recommendations can lower the risk of developing breast cancer by up to 67%. The study took several years and these three recommendations are:

- limiting alcohol consumption,
- following a wholesome plant-based diet most of the time,
- maintaining a healthy body weight.

Switching from a traditional diet to a plant-based diet is connected to potential iron deficiency. Iron is usually identified with meat and other animal by-products. Iron is most frequently present in tissues and muscles, and is called heme iron. Overconsumption of heme iron is responsible for premature death and can lead to type two diabetes. Iron balancing is very important: underconsumption of iron can lead to anaemia, whilst overconsumption can lead to cancer and heart diseases. The human body has no particular mechanism of “cleaning” itself of excess iron (Hurrell and Egli, 2010), instead it can regulate the amount of absorbed iron in the intestines. Too little iron boosts intestinal absorption, and too much iron decreases it. This specific mechanism works only in the case of non-heme iron. Non-heme iron, however, can be found mostly in plant-based products such as wholegrain, lentils, nuts, seeds, dried fruit and leafy vegetables (Greger, 2018).

Wholesome plant-based diets potentially contain more vitamin C than a traditional diet, which makes iron absorption more efficient and effective. Vitamin C is prevalent in plant-based products. One orange can help increase iron absorption up to six times (Saunders, Craig, Baines, and Posen, 2013).

The elimination or reduction of milk and dairy can also hold many benefits. In his study on China, Dr Cambell described the correlation between casein and liver cancer. Studies were conducted on rats, divided into two groups, one receiving food containing up to 20% of protein (casein) and another receiving food containing up to 5% of protein (casein). All the rats in the first group developed liver cancer, however, none of the rats in the second group developed liver cancer (Campbell and Campbell, 2005).

Vegetable substitutes for cow's milk are casein-free, have a lower saturated acid content, and a higher fibre content. They are also often enriched with vitamins A and D and calcium (Hoffmann et al., 2015).

A well-balanced plant-based diet is related to an increase of the daily intake of fruit and vegetables. The most prevalent ingredient in most fruit is water. In raw fruit, water accounts for 75-96% of the whole fruit. Additionally, in raw fruit and vegetables there can be found many vitamins not easily available in animal products, such as ascorbic acids, vitamin A and vitamins of group B (except B₁₂ vitamin) (Jarczyk and Berdowski, 1999).

3.2.2. Threats arising from a plant-based diet

Following any elimination diet can lead to potential malnutrition, deterioration of physical and mental health, avitaminosis or marasmus.

WHO and AICR recommend overall increase of a daily intake of fruit and vegetables. The origin of these products, degree of processing, and/or thermal treatment is crucial.

However, not every unprocessed plant-based products can be deemed as healthy. For example, gluten is a type of protein found in wheat, rye, barley and oat. For people suffering from coeliac disease, even a small consumption of gluten might have consequences. Wheat protein is one of the most frequently used additives in meat substitutes. Gluten is also the most prevalent compound in human diet (Caputo, Lepretti, Martucciello, and Esposito, 2010). Suffering from coeliac disease and following a plant-based diet forces one to carefully read all labels and lists of ingredients.

The consumption of processed grain might be also undesirable. Products containing processed grains are most of the time devoid of vitamins of group B, hence in the end one is consuming empty calories without any nutritional value or fibre (Greger, 2018). The daily diet of Japanese sailors was mostly based on white rice, and as a result increased their susceptibility to endemic neuritis (Booth, 2018).

Another plant-based product that might be harmful to human health is soybean. As a product mostly attributed with GMO, it can be deem controversial. It is usually

sold as cow milk substitute, and tofu. Tofu during its thermal/heat treatment loses half of its nutrients, including iron, magnesium, potassium and zinc. The plant is also known as being 'representative' among GMO products. Activists against GMO products claim that consumption of these types of food can have a negative impact on fetus development and hormonal balance (Thongprakaisang, Thiantanawat, Rangkadilok, Suriyo, and Satayavivad, 2013). Moreover soybean is a type of legumes which might cause digestion problems due to its oligosaccharides content (Cader and Lesiów, 2021).

Herbicide glyphosate, mostly known by their commercial name *Roundup*, is currently produced by Monsanto, one of the biggest soybean producers in the USA. This herbicide can have a negative impact on human health, causing an increase and growth of estrogen receptors of breast cancer (Thongprakaisang et al., 2013). In the United States, approximately 80-90% of all soy, cotton and corn cultivation are genetically modified crops. In 2009 Monsanto allocated about 9 million USD on lobbying (Lisowska, 2010).

Potential vitamin D and B₁₂ deficiency is of the most common reasons why people do not completely switch to a plant-based diet. Both of these vitamins cannot be found in plant-based products. B₁₂ vitamin (cobalamin) is produced by microorganisms; its deficiency may cause neurological, psychiatric, hematological and gastroenterological disorders (Mziray, Domagała, Żuralska, and Siepsiak, 2016). B₁₂ vitamin deficiency also potentially causes serious health consequences, including blindness, limb paresis, anemia or death (Greger, 2018; Simone, Eussen, Lisette, de Groot, and Clarke, 2005). Moreover, B₁₂ deficiency can also cause various neurological illnesses such as psychosis, dementia, problems with concentration etc. According to Gilising et al. (2010), over 50% of vegans (n = 239) that were the subject of the study, had a significant B₁₂ deficiency. However only one person among non-vegan groups suffered from B₁₂ deficiency. It is also hypothesized that the frequency of iron deficiency is related to the plant-based diet's duration, as sometimes only after a couple of years, significant iron deficiency can be noticed (Jedut, Niedźwiedz, and Glibowski, 2021).

According to EPIC-Oxford study, approximately 50% of patients suffered from B₁₂ deficiency (Medawar et al., 2019). In the cross-sectional study entitled "Threats and benefits of a vegan diet", two groups of people were subjected to the study; 36 participants followed a vegan diet and other 36 followed a traditional diet. Despite the fact that vegans consumed almost no vitamin B₁₂, the results did not show B₁₂ deficiency. The reason was a high level of supplementation among almost all vegans (Weikert et al., 2020).

The most frequent symptoms of B₁₂ deficiency are: trophic changes in mucous membranes, atrophy of the tongue papillae, changes in taste, weight loss or weight gain (Zubowska, Zalewska-Szewczyk, Stengert, Mycko, and Młynarski, 2011). B₁₂ also supports fat, carbohydrates, amino acids, nucleic acids metabolism. An adult should consume amount of 2.5 µg/day of B12 (Zubowska et al., 2011). Pregnant women should consume 2.8 µg/day of B₁₂ (Drews, 2015). Aa adequate dosage of

B₁₂ vitamins is crucial for the proper development of the fetus, using B₁₂ to perform various biochemical reactions. B₁₂, folic acids and B₆ perform DNA synthesis. The incorrect dosage of B₁₂ can result in the development of numerous problems related to cognitive and psychosomatic fetus development (Drews, 2015).

B₁₂ is stored in the liver and can last for approximately up to 5-10 years (Greger 2018; Jedut et al., 2021). According to the study conducted by Chałabasińska, among subjects following a plant-based diet, there was observed a significant deficiency of cobalamin. On the other hand, among subjects following a plant-based diet for less than 5 years, there was not any significant B₁₂ deficiency (Jedut et al., 2021).

Calcium is one of the most important components of the human diet, due to its support of blood clotting. Powdered milk contains 1404 mg of calcium for every 100 g of the product, which covers almost entire daily required calcium dosage for every age group. Calcium deficiency in children might result in rachitis, and in adults in osteoporosis and osteomalacia (Pawlicka, Smuczyński, Woźniak, Siedlecki, and Śniegocki, 2013).

Vitamin D supports bone modelling and mineralization. The common source of vitamin D is the Sun. The 'easiest' access to vitamin D occurs in countries located near the equator. For an adult 15 minutes of being outside during the day without SPF provide a daily dosage of 2.000 IU, which is the required daily dosage. South-east Poland consists of the least 'sunny' regions. In the south-west Poland, the sunlight is the strongest during spring, however during summer the sunlight is strongest in the central and southern regions of the country. During autumn, the least sunlight is provided to mid-west regions (Kozmiński and Michalska, 2004).

In the geographic zone that Poland is located in, skin synthesis is provided from April to September. However it is required to spend at least 15 minutes outside in the sun, without SPF, exposing at least 18% of skin. During other months the skin synthesis is not present, therefore it is required to supplement with vitamin D (Charzewska, Chlebna-Sokół, Chybicka et al., 2010).

Products with the biggest content of vitamin D are dairy from cows and goats nevertheless, the vitamin D absorption can be hampered in the case of people suffering from lactose intolerance.

It is recommended for infants to take at least 400 IU of vitamin D per day. For premature newborns the daily dosage of vitamin D is between 400 and 800 IU per day. Breast-feeding infants and infants fed with baby milk formula are required to take approximately 400 IU of vitamin D per day. In cases of mixed feeding, the doctor should decide on an adequate dose of vitamin D. Children and adolescents should take 400 IU of vitamin D per day, however overweight children and adolescents are required to increase their daily dosage up to 800-1000 IU of vitamin D per day. Moreover adults over 65 years old, and pregnant women are also required to take an increased daily dosage of vitamin D. Vitamin D deficiency can lead to rachitis, osteoporosis, type II diabetes, tumors, autoimmune diseases and cardio-vascular diseases (Charzewska et al., 2010).

Iodine is one of the most important minerals required for the proper functioning of the human body, especially when it comes to proper function of thyroid. The best known source of iodine is iodized salt, however it is also deemed as one of the biggest ‘killers’ of the century, and it should be used in very small quantities (Lim et al., 2012). Other known sources of iodine are seafood and cow dairy are available in most supermarkets.

Among the plant-based products containing iodine are Nori – Japanese algae grown in tidal waters on rocks. During the ebb tide, they absorb nutrients present in water and during the flow tide the sunlight.

Nori also contain amino acids and are a source of vitamin B. Immediately after the tragedy in Fukushima in 2011, the majority of Japanese citizens consumed nori instead of locally grown vegetables (Booth, 2018). Recommended iodine dosage for an adult is 150 µg per day, which corresponds to two Nori sheets. However, there is justified apprehension of Nori sold in stores coming from Japanese regions that had been radioactivated. Algae grown for sale are cultivated in reservoirs kept far away from oceans (Greger, 2018).

Omega-3 fats are mostly regarded as ‘good fats’, and play a crucial role when it comes to healthy hair, skin and nails. Fish oil is one of the best known sources of ‘good fat’. Unfortunately, the oceans are slowly being transformed into garbage dumps, which might result in fish being contaminated.

Flax-seed can also be a source of omega-3 fats, vitamins A and E. It is also known as a *superfood*, meaning that even a small quantity of the flax-seed can provide a various nutrients. Moreover flax-seed can also be a source of fibre, thanks to the content of cellulose and lignin (also known as linseed) (Kiryluk and Kostecka, 2020). Linseed, the ingredient of flax-seed, is a source of omega-3 acids. It constitutes approximately 40% of fat, of which almost 60% are the previously-mentioned fats (Bartkowski, 2013). When it comes to linseed oil, it is important for the linseed to be cold-pressed, considering the fact of the amount of omega-3 acids cannot be stored for a long time, because the oil becomes bitter in taste and the precipitate is shown (Dzięcioł and Przysławski, 2013).

Besides omega-3 fats, vitamin A and E, it also contains vitamins C, B₁, B₂, B₃, B₅, B₆, folic acids and nutrients such as Ca, Mg, P, Cu, P, Zn (Wawryka, Teodorczyk, and Zdrojewicz, 2017).

The required daily omega-3 dosage intake is 250 mg, which stands for one tablespoon of flax-seeds (Greger, 2018).

Another threat arising from a plant-based diet is the overconsumption of sugar and salt, which are often added in ‘fake meats’ as flavour enhancers. Carefully reading labels is important because one might exceed the daily dosage of salt which is 5 g of salt per day (www.who.int). Overconsumption of salt can lead to stroke, cardiovascular diseases and hypertension (Jarosz and Traczyk, 2010; Knieć and Kujawska-Łuczak, 2012). In a study conducted in 2016 in Poznań by the Medical University of Karol Marcinkowski (n = 100) over 76% of subjects exceeded the

daily dosage of salt recommended by WHO. The average consumption of NaCl was 6.93g per day (Łazarczyk, Grabańska-Martyńska, and Cymerys, 2016).

Any elimination diet can lead to some kind of deficiency, whether it is vitamin, mineral or microelements deficiency. As a result, a proper supplementation is always recommended (Schlegel-Zawadzka and Barteczko, 2009).

Plant-based diets can also lead to diseases such as favism and lathyrism.

Favism occurs in patients with glucose-6-phosphate dehydrogenase (G6PD) deficiency following the ingestion of fava beans. It is an acute hemolytic syndrome. The severity of hemolytic anemia and hemolytic episodes varies from patient to patient thus favism's diagnosis can be challenging. According to the case report from 2022, G6PD-deficient individuals can be triggered not only by fava beans, but also other substances such as a wide range of drugs, industrial chemicals, and alcohol (Diegues, Simoes, Ceriz, Lopes, and Tome, 2022).

Grass pea (*Lathyrus sativus* L.) is a legume that causes lathyrism, a neuro-degenerative disease in humans and domestic animals. Due to this issue it was banned for consumption in some countries. However, according to the article by the Institute for Sustainable Agriculture, lathyrism is mostly caused in cases of overconsumption of grass pea, therefore in Spain the ban has now been removed (Rubiales, Barolli, and Flores, 2020).

Besides the above-mentioned issues, a plant based diet can also lead to intoxication caused for example by consumption of cyanogenic glycosides.

Cyanogenic glycosides are ingredients present in green plant tissue, almonds, flax seed, and wild lima beans (Frehner, Scalet, and Conn, 1990). These are natural plant toxins that cause exposure to cyanide. The exposure occurs during pulverizing the edible plant material while processing the food crop or during consumption. The cyanide exposure may lead to severe intoxication, characterized by growth retardation and neurological symptoms resulting from tissue damage in the central nervous systems. (Bolarinwa, Oke, Olaniyan, and Ajala, 2016).

4. Conclusion

A plant-based diet means the complete exclusion of any animal products and by-products. It is a type of elimination diet that require the consumption of a well-balanced substitute products. The reasons behind switching from traditional to plant-based diet can be numerous.

Economic and health-related reasons indicate that switching from traditional to plant-based diets, can save financial resources allocated to grocery shopping and medical expenses. This reason however can carry a more or a less significant meaning depending on the area and prices of plant-based food prices in this particular area. Ecological reasons focus on environment protection. Ethical reasons are the most restrictive because they usually exclude all animal by-products used in everyday life.

A plant-based diet is linked to potential benefits and threats. It can increase daily fibre intake, and lower the risk of suffering from so-called lifestyle diseases such as obesity or high blood pressure. However, when following an unbalanced, unhealthy plant-based diet, people put at risk their healthy and even their life.

Knowledge of the adequate dosage of microelement and vitamins such as D and B₁₂ is crucial. One of the plant-based diet requirements is D and B₁₂ compulsory supplementation.

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