

# Vegetarian diet – facts and contradictions

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### Abstract

Vegetarian diet is usually regarded as a healthy practice; however, the benefits and risks of this diet remain uncertain.

The author analyses the possible nutritional benefits and

concerns in vegetarianism and tries to give basic information to a better nutritional care in this practice.

Key words: nutrition, vegetarianism, diet.

### DEFINITION

Vegetarianism is the intake of a diet made up predominantly by food of vegetal origin. A big part of epidemiology and clinic studies on vegetarians, classifies them as “vegans” or “pure vegetarians”, “lactovegetarians” or “ovolacto-vegetarians”. The “pure vegetarians” do not eat food of animal origin (except perhaps honey), the lactovegetarians eat dairy products, and ovolacto-vegetarians add egg to dairy products, excluding all other products of animal origin.<sup>1</sup>

### HISTORIC CONTEXT

For centuries, vegetarian diets were used to supply nutritional needs, often due to the economic needs of developing countries; however, for several centuries, that its use was related to ethic and religious issues, associated to a notion of a healthy nutritional pattern. Pythagoras is considered as the founder of the vegetarian movement, although, very likely, he might have been it together with other Greek personalities of his time.<sup>2</sup> Some religions, as Buddhism and Hinduism, promote the use of vegetarian diets with the intention of preserving animal life.

The vegetarian movement has expanded considerably in the 19th Century, forming vegetarian groups, a literary publication favoring the vegetarian diet and opening restaurants promoting this kind of diet. Such expansion was consolidated in the 20<sup>th</sup> Century, with an increased interest and knowledge on the vegetarian diet.

It is thought that the percentage of vegetarians in a developed western society, as the United States, is

around 10%.<sup>2</sup>

The growth of the vegetarian population makes necessary to inform health professionals, particularly doctors and nutritionists, on this diet, as well as its potential risks and benefits.

### THE VEGETARIAN DIET COMPOSITION

Vegetarians have a lower intake of calories, as their diet is made up of a lower total amount of fat and proteins (opposite to a higher quantity of complex carbohydrates). A vegetarian diet is also, comparing it to a non vegetarian diet, less rich in cholesterol and saturated fat, having a higher ratio of non saturated fatty acids and a higher content of food fibers.<sup>3</sup>

The main worry of health professionals regarding vegetarian diets has been to ascertain protein intake, specially referring to essential aminoacids. However, the different studies made at this level, reveal the vegetarians usually have an adequate intake of protein. This fact seems related with the consumption of a wide variety of vegetal foods rich in proteins, such as grains, seeds and dry fruits.<sup>4</sup>

It was verified that vegetarians do have an adequate intake, or even higher, of most vitamins, including A, C, thiamine and riboflavine. It was speculated that vitamin B6 consumption might be lower, however it was concluded that is at the same level of the non vegetarian population; folate tissue level seems also to be at the same level of the general population and it was verified the presence of high levels of vitamin E, what can account for the lower levels of atherosclerosis among the vegetarian population.<sup>5</sup>

Although vegetarians have an adequate intake of several vitamins, they tend to show a lower level of vitamin B12 and vitamin D intake in what relates to the non vegetarian population; the justification lies in the fact that all these vitamins are found mainly in food of animal origin. Although some vegetable

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sources are considered sound sources of vitamin B12 (such as soya products), are, actually, inadequate, as cobalamin, part of its composition is a vitamin B12 inactive analogous. As a matter of fact, plants do not make the synthesis or the storage of vitamin B12; the source of this vitamin is the microbial synthesis; vitamin B12 only exists in vegetables if these are contaminated by bacteria producing it; it is more likely that such contamination is observed in situations where hygiene sanitary proceedings and food manipulation are not adequate and can justify the fact of vitamin B12 deficiency not to be frequent in vegetarian people of developing countries. Animals either take the vitamin or absorb what is produced by bacteria in their bowels, being subsequently, possible sources of vitamin B12. It is remarkable, however that in spite of what was stated, rare cases of vitamin B12 deficit among vegetarians were described; the reasons for this to happen are related with the few needs of this vitamin, the relatively adequate intake and a very efficient entero-hepatic circulation recovering a great part of the vitamin B12 excreted in the bile. Intestinal bacteria produced vitamin B12; however, most of such production occurs downstream of the ileum location where vitamin B12 is absorbed, ending up eliminated in the stools. Health professionals must pay attention to the consumption of alcohol, tobacco and certain drugs as neomycin, colchicine and aminosalicic acid can contribute to certain conditions of vitamin B12 deficiency, due to the fact of causing malabsorption of such vitamin.<sup>6</sup>

To reduce vitamin D intake, characteristic of a vegetarian diet, is essentially worrying during the winter in pure vegetarians, due to a lower sun exposition, special attention should be given to growing children and adolescents.<sup>2</sup>

Calcium intake, in a direct proportion to vitamin D, due to its role in the bone metabolism, represents another focus of particular worry in vegetarians. The highest risk group is obviously the pure vegetarians, as very few foods represent such a rich calcium source as dairy products; some vegetables can provide substantial amounts of calcium, as broccoli, cabbage and mustard; leguminous and nuts also help to calcium intake. Soya milk can be an alternative as a source of calcium to pure vegetarians, yet diet supplements can be considered while growing.<sup>7,8</sup>

The studies made among the vegetarian population have demonstrated an adequate intake of other

minerals, with the possible exception of iron and zinc. Typically, the best sources of such mineral include meat and in the case of zinc, marine produce; grains and leguminous can also help to bring about significant amounts of iron and zinc; vegetable leaves also contain reasonable amounts of iron; therefore, the consumption of adequate amounts of vegetable proteins should provide enough amounts of iron and zinc. The high consumption of C vitamin in vegetarian diets can also contribute to avoid iron deficits. In general, it is observed that the iron and zinc nutrition condition in vegetarian individuals is normal, but a small segment of young vegetarian women can be at risk of deficiency, due to their preference for a diet made up mainly of fruit, vegetables and no grains.<sup>9,10,11</sup>

### VEGETARIAN DIET IN GOOD HEALTH AND IN ILL-HEALTH

Vegetarians in developed countries can easily (and usually do it) get an adequate nutrition, for which rarely display any clinic manifestations of nutritional deficiencies.

The association of the vegetarian diet with a reduction on the risk of different chronic pathologies is well documented (*Table 1*). The standard *ratio* of general mortality is clearly reduced in vegetarians and recognized to have a higher consumption of fruit and polyunsaturated fatty acids and a lower amount of saturated fats, cholesterol and alcohol compared to the general population. Usually, they also smoke less, have a lower body mass index and do more exercise.<sup>12</sup>

The lower levels of cholesterol and saturated fats intake, with a higher proportion of polyunsaturated fatty acid, affect clearly the vegetarian lipid profile. Total cholesterol and LDL total values are systematically lower than the controls of the non vegetarian population. Curiously, triglycerides serum values do not change significantly regarding the non vegetarian population and the data regarding HDL cholesterol are inconsistent.<sup>13</sup>

The high content of fibers in the vegetarian diet can also contribute for a lipidic profile favorable to vegetarians.<sup>13</sup> Several studies in vegetarian groups reveal lower values of blood pressure. The cause of such lower values of blood pressure was not yet totally clarified. A possible mechanism is related with a potassium high intake, which could be responsible

TABLE I

Comparing the prevalence of some pathologies in the vegetarian population and the non vegetarian population

	Non vegetarians (n = 1711)	Vegetarians (n = 106)	Statistic test	P value
Abdominal perimeter (cm, average $\pm$ SE)	79.8 $\pm$ 0.5	75.0 $\pm$ 1.5	F = 9.66	0.002
<b>Patology (%)</b>				
Diabetes	4.9	1.3	$\chi^2 = 1.97$	0.160
Coronary disease	3.7	4.0	$\chi^2 = 0.02$	0.889
VCA	1.9	0.0	$\chi^2 = 1.45$	0.228
High blood pressure	15.3	6.7	$\chi^2 = 4.15$	0.042
Hypercholesterolemia	11.3	6.8	$\chi^2 = 1.44$	0.230
Cancer	8.3	1.3	$\chi^2 = 4.70$	0.030
Osteoporosis	6.1	8.0	$\chi^2 = 0.44$	0.506
None of the above	67.7	78.4	$\chi^2 = 3.62$	0.057

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for reducing the peripheral vascular resistance.<sup>14-17</sup>

The effects described in the lipid profile of the vegetarian diet and the values of blood pressure are the factors, mainly involved in the benefits seen in the cardiovascular system. As a matter of fact, several studies show a lower incidence of heart ischemic disease in vegetarians and the introduction of this kind of patients who suffered cardiovascular events, together with the control of all other risk factors, as stopping smoking, and “stress” control, has allowed a steep reduction on morbidity.<sup>18</sup>

The possible mechanism of cancer protection regarding vegetarianism remains unknown. Several epidemiological studies show a strong negative rapport between the intake of plantix and colon, breast and prostate carcinoma, reason why its abundance in the vegetarian diet above mentioned may be the responsible for the lower incidence of such tumors verified in the vegetarian population. More uncertainty exists regarding the perception of other cancer risk factors associated to the consumption of animal tissue; for instance, the deposition and concentration of organic or inorganic toxins in such tissues.<sup>19</sup>

Other clinical conditions seem to have less prevalence in the vegetarian population; it is the case of type 2 diabetes mellitus, biliary lithiasis and osteoporosis.<sup>20,21,22</sup>

In the case of type 2 diabetes mellitus, its lower prevalence is justified by the positive relationship existing between obesity, protein consumption and such entity; both, as we saw, are reduced in vegetarianism. The high intake of plantix reduces postprandial glucose and it is pointed out as a potential protector factor in the development of type 2 diabetes mellitus.<sup>23,24</sup>

#### VEGETARIAN DIET THROUGHOUT LIFE

The risk of nutritional deficiency is higher in growing up periods and must be assured by an adequate intake of all nutrients at this time of life.

#### PREGNANCY AND BREASTFEEDING

Ovolacto-vegetarian diet can assure an adequate nutritional intake during pregnancy and breastfeeding, but it will be necessary a particular attention to a pure vegetarian diet, particularly regarding the total calorie intake, iron, vitamin B12, calcium and vitamin D.

It was verified that vegetarian women tend to breastfeed more and for a longer period their children compared to the general population; such fact implies a continuous assessment of surveillance of their nutritional condition and food intake.

There are reports referring the possible risk increase of premature labor and lower weight at birth in pure vegetarian women following a stricter diet; such fact

can be related with the lower levels of ferritin verified in such cases, reason why it is essential to assure an adequate intake of iron in all pregnant women.<sup>25</sup>

Usually, vitamin B12 reserves, after labor, are enough for a 6 to 12 months period; however, several cases of deficiency of such vitamin in children of pure vegetarian mothers before the 6 months of age. Such children were totally fed by maternal milk, where the vitamin B12 level revealed itself lower than required, along with low serum levels. Clinical manifestations of vitamin B12 deficiency in children, include a reduction on social skills and activity, apathy and regression on motor control; such children are usually very small for their age and can display serious neurologic deficits. The administration of vitamin B12, improves quickly the clinical condition of most of such cases; however, neurologic deficits can remain in some cases.<sup>26</sup>

Particular attention must be given to calcium and vitamin D intake, due to its critical role on the bone formation and development; the risk of a nutritional deficit of such nutrients is, once more, higher for pure vegetarian women and the doctor or the nutritionist should be attentive and if necessary, to intervene in such cases.<sup>27</sup>

Essential fatty acids and related substances have an important role in the unborn child development, especially in the retina development and the central nervous system. The docosahexaenoic acid (DHA, 22: 6n-3) is abundantly present in fish, in small amounts in eggs and eventually absent in foods of vegetal origin. Contrasting with the lower levels of DHA, the vegetarian diet has high amounts of linoleic acid, however high levels of linoleic acid inhibit such process. Lower levels of DHA were detected in the serum and maternal milk of pure vegetarian women; it was suggested that such women could use soya oil, having a lower amount of linoleic acid, to ease the DHA synthesis.<sup>28,29</sup>

### CHILDHOOD

In spite of the fear related with a possible nutritional compromise in vegetarian children, there is little evidence of any physical or intellectual reduction in such children. Usually, pure vegetarian children weigh less and are slightly smaller than non vegetarian controls, but growing up tends to occur in a normal way, with a balance between the two groups occurring around 10 years of age.<sup>30</sup>

Once again, it should be given particular attention to some essential items due to its direct implication in growing up and development, as are vitamin D, calcium, iron and vitamin B12.<sup>25</sup>

### ADOLESCENCE

In this stage of life it should be kept a particular attention to the above mentioned nutrients, as this is still a crucial stage of the individual development and growing up.

### ADULTHOOD AND OLD AGE

The vegetarian diet can be adopted in adulthood as an attempt to lose weight, to reduce the risk of disease or as part of a therapy option to the control for an existing pathology.

As it was mentioned, vegetarians, namely pure vegetarians, usually weigh less and have lower levels of blood pressure and serum cholesterol.

Some cases of lower levels of vitamin D in elderly vegetarians were described, as well as marginal nutrition conditions of iron and zinc. An adequate nutritional intake of vitamin D in vegetarian elderly women is essential to keep an adequate bone mineral density and its intake, combined with an adequate sun exposition, must be assured.<sup>31,32</sup>

Due to changes in absorption, the risk of vitamin B12 deficiency increases with age, whether in vegetarians and non vegetarians; possibly, in the case of vegetarians, due to the reduction of the reserves in such vitamin, such manifestation can be displayed earlier; therefore, it should be given particular attention to this situation.<sup>(33)</sup>

### CONCLUSION

It seems it was demonstrated the possible benefit of the vegetarian diet in certain pathologies, namely blood hypertension, hypercholesterolemia, type 2 diabetes mellitus and obesity, all risk factors for cardiovascular disease; such fact, associated to the trend shown by vegetarians for a lower incidence of smoking habits, has contributed to the marked reduction of cardiovascular morbidity and mortality in such population.<sup>34</sup>

The incidence of certain types of neoplasm (particularly neoplasms associated to a high caloric and fatty acids intake), is also reduced in the vegetarian population. The high quantity of plantix taken and eventually the richness of natural antioxidants will

also be decisive factors for such fact.<sup>34</sup>

To adopt a vegetarian diet involves, however, some risks; but such risks are particularly relevant in pure vegetarians where the risk of deficiency in certain types of nutrients is higher. The risk is particularly higher in nutrients predominantly found in products of animal origin, as vitamin B12 and vitamin D. Children of pure vegetarian women who breastfed who, as we saw, are particularly sensitive to nutritional deficits, for what requires a strict professional follow-up.

We think that vegetarian diet can mean more than an ideology for those who follow it, than actually the setting up of a diet with therapeutic effect, or simply “healthy” based in scientific facts. As a matter of fact, the benefits of such diet can be achieved through a normal diet as withdrawn the factors acknowledged as aggressors, as a high caloric quantity or saturated fat. While the ovalacto-vegetarian diet (or lactovegetarian) may be used without a significant risk, the pure vegetarian diet seems to be very restrictive, with a real risk of specific nutritional deficiency and hardly, its possible benefit can overcome the risk which represents. It is essential, very particularly in this last kind of diet, a strict surveillance of the nutritional condition and to correct any nutritional deficiency on the part of the health care professional. ■

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