PRACTICE APPLICATIONS
Topics of Professional Interest

VegPlate: A Mediterranean-Based Food Guide for Italian Adult, Pregnant, and Lactating Vegetarians

VEGETARIAN DIETS EXCLUDE all types of flesh foods (meat, poultry, game, seafood). They can be further classified as *vegan* if they exclude all animal-derived products, *lacto-ovo-vegetarian* if they still include dairy products and eggs, *lacto-vegetarian* or *ovo-vegetarian* if they only include dairies or eggs, respectively, as animal-derived products.

Although vegetarian diets are usually defined by the foods they exclude, their most important characteristic is that they do include a variety and abundance of plant foods (grains, legumes, vegetables, fruits, nuts, seeds, vegetable oils, herbs, and spices).

In December 2016, the Academy of Nutrition and Dietetics released its latest position paper on vegetarian diets, once more stating that well-planned vegetarian diets are suitable for all stages of life, are healthful and nutritionally adequate, may provide health benefits in the prevention and treatment of chronic diseases, and are associated with less environmental damage.[1] Since the first pyramid-shaped Vegetarian Food Guide (VFG) was presented in 1997,[2] some other food guides for vegetarians have been developed.[3-9] Information and recommendations for vegetarians are available also in the Dietary Guidelines for the general population of some Western countries.[10]

Because of their well-documented positive effects, vegetarian diets are gaining popularity worldwide.[11]

In 2017, 7.6% of the Italian population are following a vegetarian diet.[12] Available data show a similar percentage in other European countries and a lower one in the United States, although the total number of US vegetarians is the highest in the Western World.[11]

Nevertheless, no specific recommendations have been made so far from the Italian Department of Health for vegetarian dietary planning, although dietary guidelines for the general population already encourage a daily consumption of whole grains, legumes, vegetables, and fruits.[13]

We hereby propose the VegPlate, a new Mediterranean-based VFG designed according to the new Italian Dietary Reference Intakes (DRIs).[14] It is suitable for Italian adult vegetarians and provides dietary planning from 1,200 to 3,200 kcal. It also offers specific adaptations for pregnant and lactating women, planning from 1,800 to 3,200 kcal plus additional servings for the second and third trimesters of pregnancy and for lactation. Its aim is to help both health professionals and vegetarian individuals to easily plan balanced vegetarian diets.

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FOOD SELECTION

The VegPlate is based on six food groups: grains, protein-rich foods, vegetables, fruits, nuts and seeds, and fats. To obtain representative nutritional data, we selected, within each group, a list of foods mainly belonging to the Mediterranean tradition.[15] Foods for the estimates were selected as follows:

- **Grains:** Wheat, corn, rice, millet, rye, barley, spelt, oat, buckwheat, and their derivatives (bread, pasta, and rice milk) and potatoes.
- **Protein-rich foods:** Beans, chickpeas, lentils, fava beans, peas, soybeans, and their derivatives (tofu, tempeh, and soymilk). Dairy products and eggs, although included in the protein-rich foods group, were not considered for calculations.
- **Vegetables:** Twenty-five of the most common types of vegetables in Italy.
- **Fruits:** Eighteen of the most common types of fruits in Italy.
- **Nuts and seeds:** Almonds, flaxseeds, hazelnuts, peanuts, pine nuts, pistachios, pumpkin seeds, sesame seeds, sunflower seeds, and walnuts. Unlike other VFGs,[4,5] the VegPlate groups nuts and seeds separately because of their different nutritional compositions.
- **Fats:** Olive and flaxseed oils, to maintain an optimal n-6:n-3 ratio.[16,17]

Moreover, we created two more cross-sectional groups including foods from the previous groups:

- The **calcium-rich foods** group, including the foods richest in calcium from all of the previous groups, except for fats.
- The **n-3–rich foods** group, including foods highest in n-3 fatty acids from the fats and the nuts and seeds groups.

Nevertheless, more foods that can be used in everyday life do exist. Thus, we included more choices in the groups (Figure 1). However, we suggest choosing mainly from the foods listed here because of their more favorable nutritional profiles.

PRACTICE APPLICATIONS

Food group	Foods (calcium content per serving)	Serving size (household measures)
1. Grains	Bread, crackers (whole flour)	30 g (1 regular slice)
	Whole cereal grains	30 g, dry (1 1/2 Tbsp)
	Pasta, bulgur, couscous	30 g, dry (1/3 cup)
	Popcorn	30 g, cooked (4 cups)
	Ready-to-eat cereals	30 g (3/4 cup)
	Nondairy milk made from cereals (enriched with calcium, 240 mg**)	200 mL (1 cup)
	Potatoes	120 g (1 egg-sized potato)
2. Protein-rich foods	Legumes (soybeans 77 mg*)	30 g, raw (2 Tbsp)
	Tofu (84 mg*), tempeh (96 mg)*	80 g (1/3 cup)
	Meat analogues (with soy or gluten)	30 g (3 regular slices)
	Soy (enriched with calcium 240 mg**) or cow's (240 mg**) milk	200 mL (1 cup)
	Soy (enriched with calcium 160 mg**) or cow's (160 mg**) yogurt	125 g (1 single-serve container of 125 g)
	Eggs	60 g (one, medium)
	Cheese (110 mg*)	20 g (1/4 cup)
3. Vegetables	Cooked or raw vegetables (artichoke 86 mg,* broccoli 72 mg,* cardoon 96,* chicory 150 mg,* endive 93 mg,* rocket 160 mg,* garden cress 131 mg,* green radicchio 115 mg,* taraxacum 187 mg,* turnip greens 97 mg,* watercress 170 mg*)	100g
	Vegetable juice	100 ml (1/2 cup)
4. Fruits	Raw fruit	150 g (one, medium)
	Cooked or sliced fruit	150 g
	Dry fruit (figs 84 mg*)	30 g
	Fruit juice	150 ml (3/4 cup)
5. Nuts and seeds	Nuts or seeds (almonds 71 mg,* sesame 293 mg*)	30 g (3 Tbsp)
	Nut or seed butter (almonds 71 mg,* sesame 293 mg*)	30 g (3 Tbsp)
6. Fats	Oil, mayonnaise, and soft margarine	5 g (1/2 Tbsp)
7. Calcium-rich foods	*One serving of calcium-rich foods **Two servings of calcium-rich foods Tap water, calcium 100 mg/L (125 mg*) Mineral water, calcium 350 mg/L (125 mg*)	 1,250 mL 350 mL
8. n-3–rich foods (belonging to groups 5 and 6)	Flaxseed oil	5 g (1/2 Tbsp)
	Flaxseeds, to be consumed ground	10 g (1 Tbsp)
	Chia seeds, to be consumed ground	15 g (1 1/2 Tbsp)
	Walnuts	30 g (3 Tbsp)

Figure 1. Serving sizes of foods from the different groups of the VegPlate and their calcium content.

Serving Size Calculation

The nutritional profile of all selected foods was obtained from European Institute of Oncology[18] and US Department of Agriculture[19] food databases. We calculated the size of each serving of different foods within the same group so that they would be isocaloric, while guaranteeing ease of use (Figure 1). This allowed us to obtain the average nutritional composition of one serving for each group.

Number of Servings

For each group, we estimated the number of servings needed to satisfy the Italian DRIs.[14] For different calorie requirements (1,200 to 3,200 kcal for adults and 1,800 to 3,200 kcal for pregnant and lactating women), the amount of food suggested for each group is expressed as a daily number of servings to consume (Table 1).

Table 2 reports the nutritional composition of the proposed menus. The gap between total energy requirements and energy to provide nutritional adequacy is considered as discretionary calories, to be used according to personal choice.

Graphics

The VegPlate is sliced into six areas, representative of the six main food groups, plus two cross-sectional groups. It underlines the presence of nutrients considered as critical in all life stages:

Table 1. Number of servings in the VegPlate for adults and pregnant and lactating women, and additional servings for 2nd and 3rd trimester of pregnancy and for lactation

kcal	Grains	Protein-rich foods	Vegetables	Fruits	Nuts and seeds	Fats	Calcium-rich foods[a]	n-3–rich foods[b,c]	Essential calories	Discretionary calories
VegPlate for adults										
1,200	5	3	6	1	1	1	6	2	1,153	47
1,400	7	3	6	1	1	1	6	2	1,343	57
1,600	8	3	6	1.5	1.5	1	6	2	1,548	52
1,800	9	3	6	2	2	1	6	2	1,754	46
2,000	10	3	6	2.5	2	2	6	2	1,926	74
2,200	11	3	6	3	2.5	2	6	2	2,131	69
2,400	12	3	6	3	3	2	6	2	2,304	96
2,600	13	3	6	3.5	3	3	6	2	2,476	124
2,800	14	3	6	4	3	4	6	2	2,648	152
3,000	15	3	6	4.5	3	5	6	2	2,821	179
3,200	16	3	6	5	3	6	6	2	2,993	207
VegPlate for pregnancy and lactation										
1,800	9	3	6	2	2	2	6	2	1,798	2
2,000	10	3	6	2.5	2	3	6	2	1,971	29
2,200	11	3	6	3	2	4	6	2	2,143	57
2,400	12	3	6	3	2.5	5	6	2	2,361	39
2,600	13	3	6	3.5	2.5	6	6	2	2,533	67
2,800	14	3	6	4	2.5	7	6	2	2,705	95
3,000	15	3	6	4.5	3	8	6	2	2,955	45
3,200	16	3	6	5	3	9	6	2	3,128	72
Additional servings,[d] 2nd trimester of pregnancy (P2)										
260	0.5	0.5	0	1	0.5	0	—	—	235	25
Additional servings,[d] 3rd trimester of pregnancy (P3)										
500	1.5	2	0	0	1	0	—	—	484	16
Additional servings,[d] lactation (0-12 mo) (L)										
500	1.5	1.5	0	0.5	1	0	—	—	469	31

[a]This total number of servings must be consumed as calcium-rich foods from the other food groups.
[b]Of which at least one serving of flaxseed oil.
[c]The number of servings of the n-3–rich foods must be included in the total number of servings of nuts and seeds or fats.
[d]To be added to the servings already set for the VegPlate for pregnancy and lactation.

Table 2. Nutrient composition of diets obtained with the VegPlate, compared with the Italian and the US Dietary Reference Intakes (DRIs)[a]

kcal	Carbohydrates, g	Carbohydrates,[b] %	Protein, g	Protein,[c] %	Fat, g	Fat,[d] %	Calcium,[e] mg	Iron, mg	Zinc, mg	Thiamin, mg	Riboflavin, mg	Vitamin B-3,[f] mg	Fiber, g
Nutritional composition of the VegPlate for adults													
1,200	165	55	60	20	32	24	798	20	10	1.8	1.7	16,1	44
1,400	205	59	66	19	34	22	858	22	12	2.1	1.7	19,4	48
1,600	233	58	72	18	43	24	925	24	13	2.4	1.8	21,4	55
1,800	261	58	79	17	51	25	993	26	15	2.6	1.9	24	61
2,000	289	58	82	16	57	26	1,039	27	16	2.8	2	25	65
2,200	317	58	88	16	65	27	1,107	29	17	3	2.1	27	71
2,400	337	56	94	16	73	27	1,158	30	19	3.2	2.1	29	77
2,600	365	56	98	15	79	27	1,204	31	20	3.4	2.2	31	80
2,800	392	56	101	14	85	27	1,251	33	20	3.6	2.3	33	84
3,000	420	56	104	14	91	27	1,297	34	21	3.8	2.3	35	87
3,200	447	56	108	13	98	27	1,344	35	22	3.9	2.4	37	91
Italian DRIs	—	45-60	46-73	—	—	20-35	1,000	10-18	9-12	1.1-1.2	1.3-1.6	18	12.6-16.7[g]
US DRIs	130	45-65	46-56	10-30	ND	20-35	1,000	8-18	8-11	1.1-1.2	1.1-1.3	14-16	25-38
Nutritional composition of the VegPlate for pregnancy and lactation													
1,800	261	58	79	17	56	28	993	26	15	2.6	1.9	24	61
2,000	289	58	82	16	62	28	1,039	27	16	2.8	2	25	65
2,200	316	58	85	16	68	28	1,086	28	16	3	2.1	27	68
2,400	337	56	91	15	81	30	1,137	30	18	3.2	2.1	29	73
2,600	364	56	95	15	87	30	1,183	31	19	3.3	2.2	31	77
2,800	392	56	98	14	93	30	1,230	32	19	3.5	2.3	33	80
3,000	420	56	104	14	106	32	1,297	34	21	3.8	2.3	35	87
3,200	447	56	108	13	113	32	1,344	35	22	3.9	2.4	37	91
Italian DRIs pregnancy/lactation	—	45-60	46-99/67-94	—	—	20-35	1,200/1,000	27/11	11/12	1.4/1.4	1.7/1.8	22/22	12.6-16.7[g]
US DRIs pregnancy/lactation	175/210	—	71/71	—	ND	—	1,000/1,000	27/9	11/12	1.4/1.4	1.4/1.6	18/17	28/29

(*continued on next page*)

Table 2. Nutrient composition of diets obtained with the VegPlate, compared with the Italian and the US Dietary Reference Intakes (DRIs)[a] (*continued*)

kcal	Carbohydrates, g	Carbohydrates,[b] %	Protein, g	Protein,[c] %	Fat, g	Fat,[d] %	Calcium,[e] mg	Iron, mg	Zinc, mg	Thiamin, mg	Riboflavin, mg	Vitamin B-3,[f] mg	Fiber, g
Nutritional composition of the additional servings, 2nd trimester of pregnancy (P2)[h]													
260	30	50	10	16.5	9	33.5	109	3	2	0.3	0.2	2	8
Nutritional composition of the additional servings, 3rd trimester of pregnancy (P3)[h]													
500	51	41	28	23	20	36	246	7	5	0.6	0.4	4	16
Nutritional composition of the additional servings, lactation (B)[h]													
500	53	44	24	20	19	36	223	6	4	0.6	0.4	4	16

[a]US DRIs Available at https://ods.od.nih.gov/Health_Information/Dietary_Reference_Intakes.aspx. Accessed August 6, 2017.
[b]Calories from carbohydrates expressed as a percentage of total energy.
[c]Calories from protein expressed as a percentage of total energy.
[d]Calories from fat expressed as a percentage of total energy.
[e]Calcium content is underestimated, because it does not account for tap water and the recommended number of servings of calcium-rich foods.
[f]Niacin synthetized endogenously from tryptophan must be added to this value.
[g]For each 1,000 kcal consumed.
[h]To be added to the nutritional composition of the VegPlate for pregnancy and lactation.

vitamins B-12 and D, calcium, and n-3 fatty acids (Figure 2A). Slice areas are equal because they do not represent the real amount of food to consume, which varies according to the different calorie intakes. The calcium-rich foods group is represented as an arch embracing all groups, except for fats, whereas the n-3–rich foods group is represented as an arch that includes part of the nuts and seeds and of the fats groups. Vitamins B-12 and D stand in the center of the plate. Discretionary calories are represented as a small side plate. Three other plates for the second (P2) and the third (P3) trimester of pregnancy and for lactation (L) have to be added to the VegPlate calculated for pregnancy and lactation (Figure 2B). Their slice areas are proportional to the amount of food to add, which varies according to the stages, but not among the different calorie intakes.

USE OF THE VEGPLATE

Adults

The VegPlate suggests the daily consumption of a fixed amount of foods from the six main groups. The emphasis on a variety of plant foods along with the attention toward certain critical nutrients are the most important recommendations to attain the adequacy of the diet. Dairies and eggs are considered optional to this end. Not to displace more nutrient-dense foods and to maximize the n-3 endogenous conversion, fats were selected and limited. Consuming primarily flaxseed oil and olive oil is suggested.[16,17] Once nutritional needs are satisfied, discretionary calories may be consumed as empty calories.

Pregnancy and Lactation

The basic structure of the VegPlate is common to all life stages, but some adaptations are necessary to meet the Italian DRIs during pregnancy and lactation. To satisfy the gradually increased requests for energy and protein occurring from the second trimester of pregnancy, we foresaw the following adaptations:

- In the main VegPlate for pregnancy and lactation, to be applied from the beginning of pregnancy to the end of exclusive breastfeeding, we heightened essential calories by increasing the

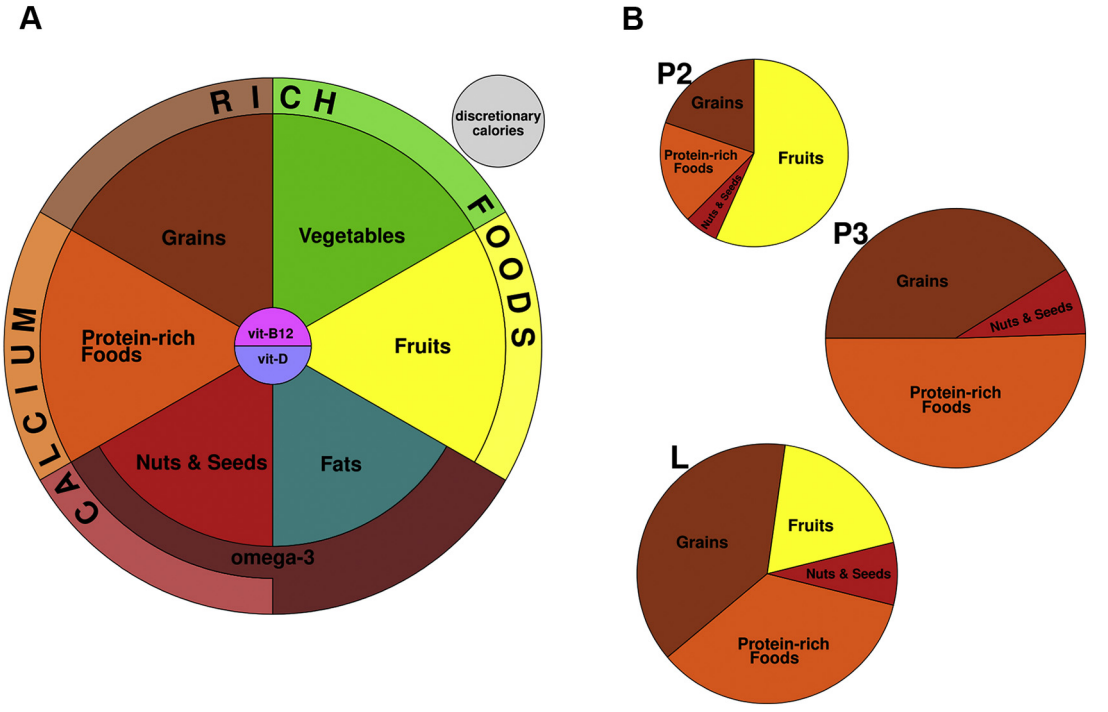

Figure 2. The VegPlate. (A) Basic structure of the VegPlate, which is the same for adults and for pregnancy and lactation. (B) Small plates are added to the main VegPlate for pregnancy and lactation during the second (P2) and third (P3) trimesters of pregnancy and lactation (L).

number of fats and reducing nuts and seeds servings, so as not to exceed the upper limit for fats.[14]

- To fully meet energy and protein requirements for the second and third trimesters of pregnancy and lactation, we added to the main VegPlate for pregnancy and lactation the three additional small plates, consisting of additional servings of foods (Table 1).

From the beginning of pregnancy, Italian DRIs also set an increase in micronutrient requirements, constant through all pregnancy, whereas during lactation the needs for calcium and iron decrease. This micronutrient requirement is already satisfied by the lowest calorie menu (1,800 kcal).

Table 2 shows that the added servings for pregnant and lactating women who are avoiding dairy products and eggs (note that such foods were not included among the estimates) provide the increased amount of energy and protein recommended by Italian DRIs.

MANAGEMENT OF CRITICAL NUTRIENTS IN THE VEGPLATE

Nutrients of concern, whose dietary intake is essential to qualify a plant-based diet as well-planned, are described in the first part of this section as the Specific Recommendations of the VegPlate. We shortly discuss in the second part of this section other nutrients, which can be of concern mainly in pregnant and lactating women and are therefore considered only in the corresponding adaptations of the VegPlate.

NUTRIENTS OF CONCERN: SPECIFIC RECOMMENDATIONS

Calcium and Vitamin D

Although dairy products are rich in calcium, they are not grouped separately as in other VFGs.[2,3,6,7,9,20] They are in the protein-rich foods group, which contributes to the daily menu, with three servings/day in adults and 3 to 4.5 servings/day in pregnant and lactating women (Table 1). According to the principle that the consumption of foods within the same food group should be varied, most calcium in vegetarian diets should be derived from plant foods. All food groups in the VegPlate, except for the fats group, contain foods that are rich in calcium, as listed in Figure 1. Water also represents a good source of highly absorbable calcium (bioavailability of 23.6% to 47.5%[21]), so that some tap waters (calcium content approximately 100 mg/L) and some mineral waters (calcium content approximately 350 mg/L) can significantly contribute to the calcium content of the diet, especially if meeting the DRIs is difficult (Figure 1).

One serving of calcium-rich food provides an average of 125 mg calcium. Although the VegPlate suggests including six servings of calcium-rich foods daily, one need not pursue this in adults and lactating women when the energy requirements are above 1,800 to 2,000 kcal. In these situations, the required amounts of calcium can be provided from the variety of the foods included in the diet. Pregnant women, whose requirements are of 1,200 mg/day of calcium, should adhere to this recommendation when their calorie requirements are below 2,400 kcal.

Although some plant foods (wild mushrooms[22]) can contain small amounts of vitamin D, its status is little affected by diet, because it mainly depends on sun exposure and supplementation.[23]

Supplementation should always be considered in subjects, regardless of the type of diet, with little or no exposure to sunlight living at northern latitudes, after assessing serum 25-OH-vitamin D.[24] In the VegPlate, vitamin D is placed at the center of the plate, to highlight its importance in a well-planned plant-based diet.

n-3 Fatty Acids

According to Italian DRIs,[14] n-3 fatty acids should represent 0.5% to 2% of total energy and should include 250 mg eicosapentaenoic/docosahexaenoic acid (DHA), which also can be endogenously converted from alpha-linolenic acid. Two servings of n-3–rich foods from the VegPlate can satisfy these recommendations by providing the amount of alpha-linolenic acid to be converted in eicosapentaenoic/DHA, thanks also to the low n-6:n-3 ratio of the menus (from 2.01:1 to 2.33:1 for adults and 2.10:1 to 2.28:1 for pregnancy and lactation).[16,17,25]

Pregnant and lactating women require a reliable source of preformed DHA, because of their increased needs.[14] In these stages a daily intake of 100 to 200 mg micro-algae–derived DHA supplement is suggested.[26]

Vitamin B-12

No active vitamin B-12 is found in plant foods: fermented products and seaweed contain B-12 inactive analogs, or B-12 concentration in such foods would be too low to meet requirements.[22,27] In fact, recent evidence suggests that not only vegans, whose diet is 100% plant-based, but also lacto-ovo-vegetarians, whose diet includes dairy products and eggs, are at risk of developing B-12 deficiency.[28-31]

The VegPlate suggests that all vegetarians meet daily DRIs for vitamin B-12 through supplements, because not many fortified foods are yet available in Italy. In the VegPlate vitamin B-12 is found at the center of the plate, to highlight its importance in a well-balanced plant-based diet.

OTHER NUTRIENTS

Protein

Protein has long been considered a critical nutrient in vegetarian diets, because protein from plant food presents one or more limiting amino acids, and they are less digestible than animal protein.

Although often being referred to as *incomplete*, proteins from a variety of plant foods contain all of the essential amino acids. Because of their lower digestibility, however, some authors recommend increases in protein intake in vegetarians of approximately 10% of the DRIs, but well-planned vegetarian diets already meet or exceed this recommendation when adequate energy intake is present.[22]

Protein intakes are of concern during pregnancy and lactation, when a parallel increase of total energy and protein needs occurs. To cope with this situation, the VegPlate adapted for this life stages proposes additional servings for second and third trimesters of pregnancy and for lactation.

Iron

Although vegetarian diets usually contain more iron than omnivorous diets, this nutrient is still considered critical because of the lower bioavailability of non-heme iron from plant foods.[32-35]

Iron bioavailability from plant foods may vary from 1% to 34% according to enhancers and inhibitors (as phytates) in the diet, whereas heme iron absorption varies from 15% to 35%.[34-36] Some methods such as soaking, sprouting, grinding, germination, and sour leavening can minimize the phytate content of foods, and the presence in the meal of vitamin C and other organic acids can reduce iron to its ferrous absorbable form, increasing non-heme iron bioavailability.[34,35]

Vegetarians show similar rates of iron-deficiency anemia and a normal iron status when compared with omnivores. Vegetarians show lower serum ferritin, which has been shown to be protective against cardio-metabolic diseases.[36] During pregnancy, iron requests increase to satisfy the fetus formation and the mother's expanded blood mass.[14] The adaptation of the VegPlate for pregnancy can answer this increased need. The Italian Institute of Heath suggests relying on supplements when hemoglobin drops below 105 g/L.[37]

Zinc

Grains, legumes, nuts, and seeds are a good source of zinc, but the high fiber and phytate content in vegetarian diets may lower its bioavailability. Vegetarians usually have lower zinc intakes compared with omnivores, and their serum zinc concentrations are lower but within the normal range.[38] Cooking methods described to enhance iron absorption also improve zinc absorption, because they reduce the phytate concentration of foods.[22]

Iodine

Seaweed is a popular food among some vegetarians, but its iodine content is highly variable, and even a small consumption can easily exceed iodine requirements, becoming risky.[14,39] For this reason, the VegPlate suggests not relying on this source. The most convenient source of iodine in vegetarian diets is iodized salt, because 1 teaspoon (5 g) for adults and 1.3 teaspoons (6.5 g) for pregnant and lactating women provide 100% of the DRI.

SUMMARY

Vegetarian diets, based on a variety of plant foods, are a healthy option for humans. People are switching their diets to plant-based because of empathy toward animals, health, and environmental reasons. In relation to the last issue, some past studies on the environmental impact of various hypothetical dietary patterns have shown that the lower the animal food content of the diet, the lower the total environmental impact.[40,41] Conversely, a recent study based on real consumptions showed a high inter-individual variability of some partial impacts among the patterns, with some vegetarians having a higher impact than some omnivores.[42] Vegetarians should receive practical information for the best dietary planning. The VegPlate represents an easy tool to plan well-balanced vegan and lacto-ovo-vegetarian diets, providing detailed indications regarding the amounts and kinds of foods to consume for adults and for pregnant and lactating women, and offering specific advice for managing critical nutrients. Moreover, most Dietary Guidelines for the general population encourage the consumption of grains, legumes, and other plant foods characteristic of the Mediterranean diet. To this aim, the VegPlate also may serve as a basis to plan a

Mediterranean omnivorous diet by including few servings of protein-rich foods as animal food, while respecting a variety of choices within the group.

References

1. Melina V, Craig W, Levin S. Position of the Academy of Nutrition and Dietetics: Vegetarian diets. *J Acad Nutr Diet*. 2016;116(12):1970-1980.
2. Sabaté J. *Vegetarian Nutrition*. New York: CRC Series in Modern Nutrition; 2001; (16):411-437.
3. Venti CA, Johnston CS. Modified food guide pyramid for lactovegetarians and vegans. *J Nutr*. 2002;132(5):1050-1054.
4. Messina V, Melina V, Mangels AR. A new food guide for North American vegetarians. *J Am Diet Assoc*. 2003;103(6):771-775. Also published in *Can J Diet Pract Res*. 2003;64(2):82-6.
5. Baroni L. Vegpyramid: A proposal for a Vegetarian Food Guide for Italian people. *Mediterr J Nutr Metab*. 2009;3(1):71-80.
6. Nakamoto K, Arashi M, Noparatanawong S, et al. A new Japanese vegetarian food guide. *Asia Pac J Public Health*. 2009;21(2):160-169.
7. Menal-Puey S, Marques-Lopes I. Development of a food guide for the vegetarians of Spain. *J Acad Nutr Diet*; 2016 Nov 2. https://doi.org/10.1016/j.jand.2016.09.008.
8. Physicians Committee for Responsible Medicine. Power plate. http://www.pcrm.org/sites/default/files/images/health/pplate/EveryMealPowerPlate.pdf#3. Accessed August 6, 2017.
9. Jenkins D, Kanner E, Katzen L, Oldways' Vegetarian & Vegan Pyramid. 2013. https://oldwayspt.org/system/files/atoms/files/OW_VegPyr_Letter.pdf. Accessed August 6, 2017.
10. Baroni L. Vegetarianism in food-based dietary guidelines. *Int J Nutr*. 2015;2(1):49-74.
11. Leitzmann C. Vegetarian nutrition: Past, present, future. *Am J Clin Nutr*. 2014;100(suppl 1):496S-502S.
12. Eurispes. Rapporto Italia 2017. http://www.eurispes.eu/content/eurispes-rapporto-italia-2017-tavola-gli-italiani-amano-il-made-italy-741-e-i-prodotti-di. Accessed August 6, 2017.
13. Consiglio per la Ricerca in agricoltura e l'analisi dell'Economia Agraria (CREA). Linee guida per una sana alimentazione italiana. http://nut.entecra.it/651/Pi_ugrave__cereali__legumi__ortaggi_e_frutta.html. Accessed August 6, 2017.
14. Società Italiana di Nutrizione Umana. Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione Italiana. http://www.sinu.it/html/pag/tabelle_larn_2014_rev.asp. Accessed August 6, 2017.
15. Bach-Faig A, Berry EM, Lairon D, et al. Mediterranean diet pyramid today: Science and cultural updates. *Public Health Nutr*. 2011;14(12A):2274-2284.
16. Masters C. Omega-3 fatty acids and the peroxisome. *Mol Cell Biochem*. 1996;165(2):83-93.
17. Harnack K, Andersen G, Somoza V. Quantitation of alpha-linolenic acid elongation to eicosapentaenoic and docosahexaenoic acid as affected by the ratio of n6/n3 fatty acids. *Nutr Metab (Lond)*. 2009;6:8.
18. Istituto Europeo di Oncologia. Banca Dati di Composizione degli Alimenti per Studi Epidemiologici in Italia. www.bda-ieo.it. Accessed August 6, 2017.
19. United States Department of Agriculture. USDA Food Composition Database. https://ndb.nal.usda.gov/ndb/. Accessed August 6, 2017.
20. United States Department of Agriculture. ChooseMyPlate. https://www.choosemyplate.gov. Accessed August 6, 2017.
21. Heaney RP. Absorbability and utility of calcium in mineral waters. *Am J Clin Nutr*. 2006;84(2):371-374.
22. Mangels R, Messina V, Messina M. *The Dietitian's Guide to Vegetarian Diets*. 3rd ed. Sudbury, MA: Johnes and Bartlett; 2011.
23. Chan J, Jaceldo-Siegl K, Fraser GE. Serum 25-hydroxyvitamin D status of vegetarians, partial vegetarians, and nonvegetarians: The Adventist Health Study-2. *Am J Clin Nutr*. 2009;89(5):1686S-1692S.
24. Wacker M, Holick MF. Sunlight and vitamin D: A global perspective for health. *Dermatoendocrinology*. 2013;5:51-108.
25. Abedi E, Sahari MA. Long-chain polyunsaturated fatty acid sources and evaluation of their nutritional and functional properties. *Food Sci Nutr*. 2014;2(5):443-463.
26. Ryan L, Symington AM. Algal-oil supplements are a viable alternative to fish-oil supplements in terms of docosahexaenoic acid (22:6n-3; DHA). *J Funct Foods*. 2015;19:852-858.
27. Rizzo G, Laganà AS, Rapisarda AM, et al. Vitamin B12 among vegetarians: Status, assessment and supplementation. *Nutrients*. 2016;8(12):pii E767.
28. Allen LH. How common is vitamin B-12 deficiency? *Am J Clin Nutr*. 2009;89:S693-S696.
29. Stabler SP, Allen RH. Vitamin B12 deficiency as a worldwide problem. *Annu Rev Nutr*. 2004;24:299-326.
30. Antony AC. Vegetarianism and vitamin B-12 (cobalamin) deficiency. *Am J Clin Nutr*. 2003;78:3-6.
31. Pawlak R, Lester SE, Babatunde T. The prevalence of cobalamin deficiency among vegetarians assessed by serum vitamin B12: A review of literature. *Eur J Clin Nutr*. 2014;68(5):541-548.
32. Rizzo NS, Jaceldo-Siegl K, Sabate J, Frase GE. Nutrient profiles of vegetarian and nonvegetarian dietary patterns. *J Acad Nutr Diet*. 2013;113:1610-1619.
33. Hurrell R, Egli I. Iron bioavailability and dietary reference values. *Am J Clin Nutr*. 2010;91(5):1461S-1467S.
34. Collings R, Harvey LJ, Hooper L, et al. The absorption of iron from whole diets: A systematic review. *Am J Clin Nutr*. 2013;98(1):65-81.
35. Monsen ER, Hallberg L, Layrisse M, et al. Estimation of available dietary iron. *Am J Clin Nutr*. 1978;31(1):134-141.
36. Haider LM, Schwingshackl L, Hoffmann G, Ekmekcioglu C. The effect of vegetarian diets on iron status in adults: A systematic review and meta-analysis. *Crit Rev Food Sci Nutr*; 2016 Nov 23:1-16. https://doi.org/10.1080/10408398.2016.1259210.
37. Istituto Superiore di Sanità. Gravidanza Fisiologica. http://www.salute.gov.it/imgs/C_17_pubblicazioni_1436_allegato.pdf. Accessed August 6, 2017.
38. Foster M, Samman S. Vegetarian diets across the lifecycle: Impact on zinc intake and status. *Adv Food Nutr Res*. 2015;74:93-131.
39. Teas J, Pino S, Critchley A, Braverman LE. Variability of iodine content in common commercially available edible seaweeds. *Thyroid*. 2004;14(10):836-841.
40. Baroni L, Cenci L, Tettamanti M, Berati M. Evaluating the environmental impact of various dietary patterns combined with different food production systems. *Eur J Clin Nutr*. 2007;61:279-286.
41. Barilla Center for Food and Nutrition. Double Pyramid 2015: Recommendations for a Sustainable Diet. https://www.barillacfn.com/m/publications/dp-2015-en.pdf. Accessed August 6, 2017.
42. Rosi A, Mena P, Pellegrini N, et al. Environmental impact of omnivorous, ovo-lacto-vegetarian, and vegan diet. *Sci Rep*. 2017;7(1):6105.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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