Essentials of Vegan Nutrition And a Vegan Diet

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Foreword

Nutrition is a complex matter. I've written this document with the vegan layperson in mind, while still maintaining the scientific integrity of the material presented. After recent masterpieces such as "World Peace Diet", by Will Tuttle, PhD (2005) and "The China Study", by T. Colin and Thomas M. Campbell, PhD (2006), which focus on the ethical, spiritual and health reasons for becoming vegan, this humble 27-page document lays out the specific nutritional and diet guidelines for how to stay healthy as a vegan.

This document demonstrates a healthy way of being vegan without any supplements by choosing wisely among the vast diversity of options available in the plant kingdom.

We all come from an ancestral herding culture as omnivores or vegetarians and all its derivations, such as vegetarians who eat eggs, milk and cheese. These derivations are very often adopted for health reasons, rather than to stop animal suffering or for ecological concerns. Most of us are not aware that if we rob milk from a cow, even if raised on an organic farm, it is because she gave birth to a calf. This calf is isolated immediately after birth, in a state of fear and despair, fed with soy milk and killed a few weeks later if it is a male or raised to be another milking cow if it is a female, continuing this cruel and vicious cycle.

Sometimes lacto-vegetarians find it difficult to stop consuming milk or cheese because these foods contain opium derivatives that create an addiction. What they do not realize is that a weaning process is required, as is the case for any addictive substance, if they want to reach the next step: a strict vegetarian diet that excludes all animal-based food, more commonly known as a vegan diet.

This healthy vegan path leads naturally to an ethical and spiritual path named ecovegan. When domesticated animals and hunted wild animals no longer serve as our "surrogate mother" (i.e., our primary food source as omnivores), we can dissociate ourselves from speciesism. This ideological elitism imposes and justifies exploitation, using and abusing animals considered inferior in a manner that would be intolerable if they were human. We can therefore adopt a non-speciesism philosophy, which requires that we abstain from using animals, not only for food, but also for clothing; shelter; medicine; religious, symbolic or totemic rituals; physical labor; teaching; scientific research; sport; emotional needs (pets); personal hygiene; cosmetics; etc.

Eating as an ecovegan also implies a veganic approach to organic agriculture, which avoids using animal products for enhancing soil. Adopting this convivial attitude leads to an end of the "predator/prey" relationship that we have with our environment for the last 10,000 years.

Generalities

Vegan metabolism is very different from that of omnivores.

It takes fewer calories and fewer proteins to generate a similar output. Vegans can easily lower their daily calorie intake by 300 to 500 calories, compared to the RDI (Recommended Dietary Intakes), and still have their needs fulfilled, but with a lighter foot print on the planet. However, these numbers must take in account physical activity, age, CMI (Corporeal Mass Index) and physiological status (pregnancy, breastfeeding, etc.). The energy requirement for an adult vegan of 60kg or 132lbs is approximately 1500kcal/day: 33% or 55g of lipids (2 tablespoons of pumpkin seeds = 10g and 1 tablespoon of oil = 13.5g), as long as these fats are of excellent quality; 60% or 225g of carbohydrates; and 7% or 27g of proteins. Our need for protein could be even less if our need for essential amino acids (EAA) are fulfilled (5.5g /day).

The scientific research on a vegan diet has already given us some encouraging results regarding health and delaying aging:

"*Vegan proteins may reduce risk of cancer, obesity and cardiovascular disease by promoting increase glucagon activity" (Med Hypothesis. 1999 Dec; 53(6): 459-85).*

"Overall glycemic index and glycemic load of vegan diets in relation to plasma lipoproteins and triacylglycerols" (Ann Nutr Metab. 2007; 51(4): 335-44.Epub 2007 Aug 28).

"Long-term low-calorie low-protein vegan diets and endurance exercise are associated with low cardio metabolic risk" (Rejuvenation Res. 2007 Jun; 10(2): 225-34).

For veganism to be a popular trend, more research is needed to get approval from nutritionists and the medical community.

We need a voluntary group of vegan subjects that would follow the basic nutrition principles laid out in this document to provide validity to future research. Most vegan research does not mention what vegans are eating (junk, soybean or simple organic staples). As a result, the findings are sometimes not so reliable. In a few years, this group could then participate in more thorough research studies that would lead to the scientific approval of a vegan diet without supplements. A human diet should be without supplements in order to be widely accepted by people and the medical community.

When you change your diet from omnivorous or vegetarian to vegan, be aware that your nutritional intuition might be distorted, causing you to seek any kind of food to fulfill your body's lack of certain minerals, vitamins, and amino acids (this medical condition is called pica). As you can imagine, this could easily lead to some unhealthy choices. The same behavior can occur when addicted to sugar, salt, or soybean by-products. So at the beginning of a change in diet towards veganism, do not trust your instinct, but your knowledge of nutrition. Later on, when you have found harmony in your new path, you can trust your intuition again to choose the food you need.

The members of the "Vegan Gourmet Club", my small organic buying club in Montreal, Quebec, have thrived with success for the last 10 years on a simple and healthy vegan diet. For complete proteins, it relies on a few key legumes (navy beans, lentils, and chickpeas), cereals (Kamut, oat, barley, and rye), pseudo-cereals (wild rice, buckwheat, and quinoa), pumpkin seeds and a lot of vegetables. For fat it uses local, organically grown and extracted sunflower oil and for a gourmet touch it uses organic spices and fruits in season. The Club's vegan diet has four directions: vegan, organic, simple and local (when possible). By simple, we mean food that is as close to its natural state as possible (i.e. no junk).

To judge protein quality you have to consider the limiting factor: the liver and cells can only synthesize all the needed proteins (approximately 1000) as long as all eight essential amino acids (EAA) are present at the same time. The one with the relatively lowest rate compared to our needs (see all the following charts) is the factor that limits the synthesized quantity. Surplus is transformed into non-essential amino acids needed for that synthesis, or ultimately into carbohydrates or lipids, because EAA cannot be stocked by our body.

In following chapters, we will see that most plant proteins are complete and possess all necessary EAA for our metabolism. In the following charts, the limiting factor is shown in bold font and the rectified data of the four most important types of EAA have been calculated. You should use those numbers if you want to compare the nutritive contents of different foods. For example: for an adult of 60kg/132lbs, if the limiting factor/100g of the food is higher than its need for this same element, the other seven EAA quantities are for sure adequate. The limiting factor is always tryptophan, methionin/cystin or lysine.

If an adult weighs under or over 60kg/132lbs, he must adjust the quantity (- or +) of 100g of food so the protein content of his meal fulfills its requirements.

Because the needs of growing children are different from those of adults, rectifying factors are different as well, but the principle of their calculation from following table is the same.

Most plant proteins are complete but a clever choice is essential for vegan health.

All data in this document come from: «*USDA Nutrients Database for Standard Reference*» at: *www.ars.usda.gov/Services/docs.htm?docid=15868*

Requirements of Essential Amino Acids (EAA) in g/kg Bodyweight and Their Relative Percentage According to the RDI*

EAA	**Adults**		**Children (10-12 yrs)**		**Babies (3-6 months)**		**Mother's milk/100g**	
Histidine	-		-		0.033	4.8 %	0.023	4.5 %
Isoleucine	0.012	13.2 %	0.028	13.0 %	0.080	11.7 %	0.056	11.0 %
Leucine	0.016	17.6 %	0.042	19.5 %	0.128	18.7 %	0.095	18.7 %
Lysine	0.012	13.1 %	0.044	20.6 %	0.097	14.1 %	0.068	13.4 %
Methionine/Cystine	0.010	11.0 %	0.022	10.2 %	0.045	6.5 %	0.040	7.9 %
Phenylalanine/Tyrosine	0.016	17.6 %	0.022	10.2 %	0.132	19.2 %	0.099	19.6 %
Threonine	0.008	8.8 %	0.028	13.0 %	0.063	9.2 %	0.046	9.1 %
Tryptophan	0.003	3.3 %	0.004	1.9 %	0.019	2.8 %	0.017	3.4 %
Valine	0.014	15.4 %	0.025	11.6 %	0.089	13.0 %	0.063	12.4 %
Total/ Day	0.091	100 %	0.215	100 %	0.686	100 %	0.507	100 %

* RDI = Recommended Dietary Intakes at http://books.nap.edu/openbook/0309046335/gifmid/57.g
Hyphen **-** means that data is not available.
Note: a 60kg/132lb adult only needs 5.5g EAA/day.

Legumes

The information in this section is based on my own experience and the following books and report: "Les légumineuses sur votre table", by Chantal and Lionel Clergeaud (2005), "Boutique Bean pot", by Kathleen Mayes and Sandra Gottfried (1992), and "IEH Assessment on Phytoestrogens in the Human Diet, Final Report to the Ministry of Agriculture, Fisheries and food, UK, November1997".

All legumes in the following table, according to their nutrient content, are complete proteins of high quality and, thus, do not need to be combined with cereals. Mixing legumes and cereals is an old belief of Amerindian and other native traditions, based on magical, religious ideas, rather than on sound nutritional knowledge: cereals, with their long grains and ears of corn, are considered "male" and legumes, with their round or kidney shape beans, are considered "female". Eaten together they celebrate life!

Due to the bacteria around their roots, legumes transform air nitrogen into proteins. For this reason, in organic agriculture, legumes are also cultivated as green manure or planted in rotation with cereals, which demand a nitrogen-rich soil (French lentil is one of the four crops rotation needed to grow Kamut).

Organically grown legumes have a great nutritional quality because they do not contain pesticides, chemical fertilizers, cholesterol or saturated fatty acids, contain very few purines (0.075%) and are rich in minerals.

Legumes harbor naturally antinutrient factors which all disappear with soaking and cooking.

Because of these antinutrient factors, you should never eat raw peas or beans and avoid their sprouting. These antinutrient factors are: phytic acid (also present in cereals, preventing mineral absorption), an antivitamin E, some cyanogenic glycosides, hemaglutinins, proteases inhibitors (disturbing the protein digestion enzymes), goitrogenic substances like vicine and convicine (sugars present in broad beans and responsible for favism, which destroys red blood cells) and lectins (toxins that cause nausea, stomach cramps and diarrhea). Finally, certain complex sugars (5-7%) are also antinutrient factors: raffinose, verbascose and stachyose, which are not assimilated by intestinal mucosa, but are transformed by some bacteria into simple sugars and carbonic gas. Flatulence eliminates this carbonic gas (soybeans and beans are rich in these complex sugars, but lentils do not and are deprived of cyanogenic glycosides and antivitamin E factor).

If you eat legumes every day, your intestines get used to these complex sugars as long as the soaking and cooking times are correct (see Simple Staple Recipes, p: 24). Still some thorough research is needed to test different soaking times, cooking methods and canning. To get used to them, you should eat them in small quantities for the first two weeks. Canned beans are certainly not soaked for 48 hours but, from time to time, they can be helpful if you go on a trip or to a restaurant. It is best to do your own soaking and cooking.
It is also better to eat split peas that have lost through the splitting process their skin which is very thick and fibrous.

As vegans, we eat a lot of fiber, but we should avoid eating it in excess. We need to eat legumes, at least five times a week, so it is very important to prepare them properly. Another way of improving the digestion of legumes is to add spices to the final preparation, such as sage or savory for beans, small onions stuck with cloves for lentils, savory and thyme for split peas and rosemary for chickpeas.

All legumes in the following table are considered complete proteins for adults and children because their limiting factor, being methionine/cystine, is higher than its requirement for one meal.

Nutritive Content of Legumes

Evaluation of Nutritive Content In 100g raw/dry	Beans Adzuki	Beans Black	Beans French	Beans Great Northern	Beans Kidney	Beans Mung	Beans Navy	Beans Small White	Beans White	Chickpeas	Lentils	Lentils, pink	Peanuts, all types	Peas, split	Needs per meal for a 60kg adult for 2 meals/day	Needs per meal for a 10-12 years old or a 30-40kg child for three meals/day
Water g	13.44	11.02	10.77	10.70	11.75	9.05	12.36	11.71	11.32	11.53	11.19	11.79	6.50	11.27		
Energy kcal	329	341	343	339	337	347	335	336	333	364	338	346	567	341		
Protein g	19.87	21.6	18.81	21.86	22.53	23.86	22.33	21.11	23.36	19.3	28.06	24.95	25.8	24.55		
Tryptophan g	0.191	0.256	0.223	0.259	0.267	0.260	0.264	0.250	0.277	0.185	0.251	0.223	0.250	0.275		
Rectified Tryptophan g	0.118	0.168	0.146	0.170	0.175	0.149	0.174	0.164	0.182	0.154	0.182	0.162	0.194	.0187	0.090	0.040-0.053
Methionine/Cystine g	**0.394**	**0.560**	**0.488**	**0.567**	**0.584**	**0.496**	**0.579**	**0.547**	**0.605**	**0.512**	**0.606**	**0.539**	**0.648**	**0.624**	0.300	0.220-0.293
Phenylalanine/Tyrosine g	1.643	1.776	1.547	1.797	1.852	2.157	1.837	1.735	1.921	1.513	1.733	1.897	2.386	1.843		
Rectified Phenyl. /Tyro. g	0.630	0.896	0.780	0.907	0.934	0.794	0.926	0.875	0.968	0.819	0.970	0.862	1.037	0.998	0.480	0.220-0.293
Lysine g	1.497	1.483	1.291	1.500	1.547	1.664	1.533	1.449	1.603	1.291	1.957	1.740	0.926	1.772		
Rectified Lysine g	0.475	0.675	0.588	0.683	0.704	0.596	0.698	0.659	0.729	0.617	0.730	0.649	0.780	0.752	0.360	0.440-0.587
Lipids g	0.53	1.42	2.02	1.14	0.83	1.15	1.28	1.18	0.85	6.04	0.96	2.17	49.24	1.16		
Carbohydrates g	62.9	62.37	64.11	62.37	61.30	62.62	60.65	62.25	60.27	60.66	57.09	59.15	16.13	60.38		
Fibers g	12.7	15.2	25.2	20.2	15.2	16.3	24.4	24.9	15.2	17.4	30.5	10.8	8.5	25.5		
Calcium mg	66	123	186	175	83	132	155	173	240	105	51	41	9.2	55		
Iron mg	4.98	5.02	3.4	5.47	6.69	6.74	6.44	7.73	10.44	6.24	9.02	7.56	4.58	4.43		
Magnesium mg	127	171	188	189	138	189	173	183	190	115	107	72	168	115		
Phosphorus mg	381	352	304	447	406	367	443	445	301	366	454	294	376	366		
Potassium mg	1254	1483	1316	1387	1359	1246	1140	1542	1795	875	905	578	705	981		
Sodium mg	5	5	18	14	12	15	14	12	16	24	10	7	18	15		
Zinc mg	5.04	3.65	1.9	2.31	2.79	2.68	2.54	2.81	3.67	3.43	3.61	3.9	3.27	3.01		
Copper mg	1.094	0.841	0.44	0.837	0.699	0.941	0.879	0.635	0.984	0.847	0.852	1.303	1.144	0.866		
Manganese mg	1.730	1.060	1.2	1.423	1.111	1.035	1.309	1.278	1.796	2.204	1.429	1.417	1.934	1.391		
Selenium mcg	3.1	3.2	12.9	12.9	3.2	8.2	11	12.8	12.8	8.2	8.2	8.2	7.2	1.6		
Isoflavones mg	-	0	-	0	0.06	-	0.21	0.74	-	0.10	0.01	-	0.26	2.42		

What about Soybean?

Soybean comes from China. It was considered one of the five sacred plants in the Chou dynasty (1134-246 B.C.), along with barley, wheat, millet and rice. But soybean seemed to be used to enhance soil fertility in crops rotation, rather than for food. It is only after the discovery of the fermentation process that soybean was eaten by Chinese as miso and tamari. Later in Indonesia, a technique of fermentation and inoculation transformed soybean into tempeh. The Chinese discovered, at around 200 B.C., that a liquid extraction of a cooked and mashed soybean or soy drink could coagulate with calcium or magnesium sulfate to make tofu. It is important to note that these new products were only used in small quantities as seasoning and not in large quantities to replace animal or cereal proteins.

Soybean as a legume has the same antinutrient factors as beans but in a greater quantity. Fermentation, cooking, techniques of making tofu and protein isolates (serving as protein supplements) do not completely eliminate these factors. Even more importantly, soybean is very rich in phytoestrogens or isoflavones (see the following table). Other sprouting legumes contain as well a lot of phytoestrogens: 560mg/100g for red clover and 72mg/100g for alfalfa. Also linseed, very popular among vegans, contains a lot of phytoestrogens (60-370mg/100g). Nowadays, the Asiatic staple diet has about 3 to 28mg/day of isoflavones from soybean.

Since the ranking of “Generally Recognized As Safe” (GRAS) was given to soybean products by the U.S. Food and Drug Administration (FDA) in 1999 (followed by the UK in 2002), a lot of questions are still without answers, regarding the long term effect on vegan health of a large intake of isoflavones and phytic acid, which inhibits the absorption of some minerals, such as zinc and calcium. In 1997, the *Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment* in the UK recommended that more research be done to assess effects of soybean and its by-products. Already this committee has alerted women with breast cancer (estrogens-dependant) to abstain from soybean products. It also recognizes that the intake of fermented soybean products increases risk of colorectal cancer. Veterinarians also limit the amount of soybean in the diet of pigs to prevent female sterility.

An important lobby from Monsanto, for GMO soybean, does a very good job promoting the acceptance of all derived soybean products and minimizes potential problems. People eating organic soybean are influenced by this growing popularity of tofu, soy drink and proteins isolates (the basis for all kinds of mock meat products). In the near future, GMO soybean problems will be corrected by biotechnology, but organic soybean will not. Plus soybean has a tendency to be quite an allergen for some people.

In addition, if you consider the following table, most of the by-products of soybean/100g do not cover our vegan needs in EAA, except for tempeh and hard tofu, but those contain/100g too much isoflavones and given that we don’t know their long term effect on endocrine system, it is better to abstain. Furthermore, most soybean by-products are not simple because they are industrially processed.

Up to now, scientific research has not proved the harmlessness of soybean products as complete proteins for vegans. As for seasoning, most tamari and miso are fermented and produced with yeast and refined sea salt and yeast tends to overcome the growth of the natural bacterial intestinal flora in our body that produces our vitamin B^{12} (see p: 20). “Bragg”, which is obtained through the hydrolysis of non-GMO soybean, contains only soybean minerals such as sodium. Personally, I have experienced addiction to that product and was using it more and more in all my recipes, so I quit. Wisdom dictates that when in doubt we should abstain, so for various reasons, a vegan staple diet should avoid soybean products and by-products choosing navy beans and lentils as legumes for complete plant proteins.

Nutritive Content of Soybean and By-Products

Evaluation of Nutritive Content In 100g raw	Whole Soybean	Soybean Sprouting	Soybean drink	Soybean Flour (whole grains)	Miso	Soybean Protein Isolates	Tofu, soft	Tofu, firm	Tofu, extra firm	Tofu, hard	Tempeh	Needs per meal for a 60kg adult, for 2meals/day	Needs per meal for a 10-12 years old or a 30-40kg child for 3 meals/day
Water g	8.54	69.05	88.03	5.16	41.45	4.98	87.26	83.69	80.59	71.12	59.65		
Energy kcal	416	122	52	436	206	338	61	77	96	146	193		
Protein g	36.49	13.09	4.48	34.54	11.81	80.69	6.55	8.04	10.41	12.68	18.54		
Tryptophan g	0.530	0.159	0.050	0.502	0.143	1.116	0.102	0.125	0.162	0.198	0.280		
Rectified Tryptophan g	0.324	0.089	0.011	0.307	0.073	0.659	0.053	0.064	0.083	0.101	0.148	0.090	0.040 0.053
Methionine/Cystine g	**1.080**	**0.295**	**0.036**	**1.022**	**0.244**	**2.176**	**0.175**	**0.214**	**0.277**	**0.337**	**0.493**	0.300	0.220-0.293
Phenylalanine/Tyro. g	3.285	1.118	0.264	3.108	0.958	7.815	0.538	0.660	0.854	1.041	1.557		
Rectified Phenyl./Tyro.g	1.728	0.472	0.057	1.635	0.390	3.482	0.280	0.342	0.443	0.539	0.789	0.480	0.220-0.293
Lysine g	2.429	0.752	0.172	2.298	0.660	5.327	0.431	0.530	0.685	0.835	0.908		
Rectified Lysine g	1.301	0.355	0.043	1.231	0.294	2.622	0.211	0.258	0.334	0.406	0.594	0.360	0.440-0.587
Lipids g	19.94	6.70	1.92	20.65	6.07	3.39	3.69	4.46	6.21	9.99	10.80		
Carbohydrates g	30.16	9.57	4.93	35.20	27.96	7.36	1.80	2.97	1.96	4.39	9.39		
Fibers g	9.3	1.1	1.3	9.6	5.4	5.6	0.2	0.4	0.4	0.6	-		
Isoflavones mg	128.35	40.71	9.65	177.89	42.55	199.25	31.10	24.74	22.63	29.50	43.52		

Cereals and Pseudo-Cereals

The information in this section is based on my own experience and Dr. Loren Cordain's article: "Cereal grains: Humanity's Double-Edged Sword" (www.thepaleodiet.com/articles/cereal%20article.pdf)

Cereals, as complete proteins for vegans, come in second place (from 9 -17%) after legumes (19-23%). Different cereals vary in their nutrient content (see table on p. 11), but most have lysine as the limiting factor, except for buckwheat and amaranth that have methionine/cystine and for quinoa that have tryptophan. Buckwheat, amaranth, and quinoa resemble monocotyledon cereals, according to their nutrient content. However, botanically speaking, they do not belong to the cereal species and are closer to dicotyledons legumes. That is why they are called pseudo-cereals.

Kamut is a complete cereal. It is a hybrid of the ancient wheat Khorasan, with a genetic code of 28 chromosomes. Its gluten is non-allergenic and has a low glycemic index, meaning it does not provoke excessive insulin production. Among cereals, Kamut has the highest content of proteins (17 to 19g/100g) and is always organic and even veganic. Harvesting Kamut is a four years rotation process with legumes as green manure and French lentils to replenish nitrogen in the soil.

Kamut is a registered trademark by Bob Quinn from Montana who brought this ancient grain to our modern world. Therefore he insures its veganic and nutritive quality (minimum 17% of proteins). Kamut has a nutty flavor and is the best choice for bread and noodles either laminated like the Japanese Sobaya Udon from "Eden" or extruded like the spirals or spaghetti also from "Eden" or "Artesian Acres". Laminated Udon are easier to digest and have a better texture because they require more sifting than the extruded spirals or spaghetti. And because vegans eat enough fiber otherwise, they can eat their pasta without too much bran. The association of Kamut with barley or buckwheat does not present any nutritive advantages because all of these grains have about the same lysine content.

Barley flour is very interesting for piecrust, biscuits or muffins, because 100g fulfill our need for EAA.

Wild rice (*zizania palustris*), despite its name, is not a type of rice, but a naturally occurring aquatic plant. It is best cooked in a pressure cooker.

Quinoa and **amaranth,** pseudo-cereals originating from Bolivia, are now cultivated in the USA. Quinoa has to be very well rinsed because its thin outer layer is bitter and soapy. For pastry, amaranth flour mixed 50/50 with barley flour is delicious. Also amaranth or quinoa can be pureed for baby food, but first needs to be soaked for 24 hours.

Teff is a cereal from the millet family. It comes from Ethiopia, but is now cultivated in the USA. Its nutritive content is very similar to millet but we do not have a complete official report from the USDA and so we cannot be sure that our needs for EAA /100g are satisfied.

Spelt is very popular among vegans and vegetarians because of the influence of Hildegard de Bingen's God-inspired writings (in the 12th century), in which she advocated the use of spelt. However, the spelt that she was referring to was small spelt or einkorn (14 chromosomes), not modern spelt (42 chromosomes). Modern spelt has almost the same nutritive content as soft wheat and the same allergenic gluten. We have to wait for ancient einkorn to be produced in North America before we could use it as an alternative to Kamut.

Based on the analysis of their nutrient content, spelt, soft wheat, durum wheat, corn, millet and rice are more of an energy source than a complete protein source. In ancient times, corn, millet and rice were sacred food eaten to honor the gods. However, they were not eaten alone. They were always mixed with legumes or animal proteins. If you are set on eating brown organic rice and meeting the EAA needs of a 60kg/132lb adult, you should cook 120g/4oz of raw brown rice per person. But eaten with a reasonable serving of vegetables, this is too large a quantity of food to digest in one meal, leaving one feeling heavy and uncomfortable. To meet your EAA requirements a better choice would be to eat a normal portion of 100g of raw brown rice and when cooked, sprinkle 20g/2 tbsp of raw ground pumpkin seeds on top of it.

To fulfill children's needs for lysine, add 20g or 2 tbsp of raw ground pumpkin seeds to all cereals, except for wild rice, oat or rye, which are already complete proteins for adults and children.

Anti-Nutrient Factors of Cereals

The anti-nutrient factors of organic cereals come from the plant itself to insure its protection against insects, fungus and other microscopic predators. The following is an overview of these factors:

- **The inhibiting factor of alpha-amylase enzyme** is very resistant to heat, which means that it resists cooking. Wheat products, rye, barley and oats all contain this factor. Its action on the alpha-amylase of saliva and the pancreas varies. After a meal, it reduces the elevation of glycemia and therefore the production of insulin and so would be considered beneficial in some cases. This inhibitor is also allergenic, causing baker's asthma. It is all a question of quantity! But for 100g/meal it does not seem to be problematic for vegans.

- **The inhibiting factor of trypsin and chemotrypsin enzyme** is also very resistant to heat, as well as to digestion. Normally it is the level of trypsin in the small intestine that regulates pancreatic activity. If this enzyme is inhibited, that could lead to pancreatic hypertrophy. This factor has been found in all cereals, but with a low impact on the trypsin level. In humans, the effects of a daily small absorption of this factor are not known, but could be beneficial against cancer.

- **Lectins** are proteins that bind to carbohydrate molecules. They are known to be the most important antinutrient factors. They resist heat and digestion and are most commonly found in gluten (wheat germ agglutinin). Only a large amount of gluten interferes with general absorption, bacterial flora, and the immune system of the intestines. Here again, scientific experiments on humans are lacking, but we are quite sure that lectins aggravate gluten allergy and celiac condition.

-**Phytic acid** is naturally part of bran, which preserves grains and also contains a phytase enzyme. This enzyme gets activated if you soak grains for 24 hours before cooking. To avoid anti-nutrient factors in flour, you should partially sift it, despite the resulting loss of some bran mineral contents.

In all cases it is very important to buy cereals void of mycotoxins that could develop in moldy stocking conditions. These mycotoxins are very harmful. Grains should be kept in a dry and dark place. Oats are particularly susceptible to mycotoxins. This is why oats are stabilized by an 180°F heating process after being harvested.

The inconvenience of cereal antinutrient factors should not be a real concern for vegans. Don't worry; be happy to eat one or sometimes two cereal meals/day in a just quantity to meet EAA requirements.

Nutritive Content of Cereals and Pseudo-Cereals Grains

Evaluation of Nutritive Content For 100g raw/dry	* Amaranth	* Barley	* Buckwheat	Corn, yellow	Millet	* Oats	* Quinoa	Rice, Brown, long-grain	* Rye	Wheat, Durum	* Wheat, Kamut	Wheat, soft	* Wild Rice	Needs per meal For a 60kg adult For 2 meals/day	Needs per meal For a 10-12 years old Or a 30-40kg child For 3 meals/day
Water g	9.84	9.44	9.75	10.37	8.67	8.22	9.30	10.37	10.95	10.94	9.8	12.17	7.76		
Energy kcal	374	354	343	365	378	389	374	370	335	339	359	331	357		
Protein g	14.45	12.48	13.25	9.42	11.02	16.89	13.10	7.94	14.76	13.68	17.3	10.35	14.73		
Tryptophan g	0.181	0.208	0.192	0.067	0.119	0.234	**0.120**	0.101	0.154	0.176	0.117	-	0.179		
Rectified Tryptophan g	0.125	0.116	0.120	0.048	0.053	0.175	**0.120**	0.075	0.151	0.076	0.110	-	0.157	0.090	0.040-0.053
Methionine/Cystine g	**0.417**	0.516	**0.401**	0.367	0.433	0.720	0.460	0.255	0.577	0.507	0.755	0.474	0.612		
Rectified Meth. /Cystine g	**0.417**	0.388	**0.401**	0.162	0.177	0.584	0.400	0.252	0.504	0.252	0.367	?	0.524	0.300	0.220-0.293
Phenylalanine/Tyrosine g	0.871	1.058	0.761	0.846	0.920	1.468	0.840	0.708	1.013	1.038	1.280	0.835	1.343		
Rectified Phenyl. /Tyrosine g	0.667	0.620	0.642	0.265	0.283	0.935	0.638	0.404	0.807	0.404	0.587	?	0.839	0.480	0.220-0.293
Lysine g	0.747	**0.465**	0.672	**0.195**	**0.212**	**0.701**	0.510	**0.303**	**0.605**	**0.303**	**0.440**	**0.315**	**0.629**		
Rectified Lysine g	0.502	**0.465**	0.483	**0.195**	**0.212**	**0.701**	0.480	**0.303**	**0.605**	**0.303**	**0.440**	**0.315**	**0.629**	0.360	0.440-0.587
Lipids g	6.51	2.30	3.40	4.74	4.22	6.90	5.80	2.92	2.50	2.47	2.6	1.56	1.08		
Carbohydrates g	66.17	73.48	71.50	74.26	72.85	66.27	68.90	77.24	69.76	71.13	68.2	74.24	74.90		
Fibers g	15.2	17.3	10	7.3	8.5	10.6	5.9	3.5	14.6	-	1.8	12.5	6.2		
Calcium mg	153	33	18	7	8	54	60	23	33	34	31	27	21		
Iron mg	7.59	3.60	2.20	2.71	3.01	4.72	9.25	1.47	2.67	3.52	4.2	3.21	1.96		
Magnesium mg	266	133	231	127	114	177	210	143	121	144	153	126	177		
Phosphorus mg	455	264	347	210	285	523	410	333	374	508	411	493	433		
Potassium mg	366	452	460	287	195	429	740	223	264	431	446	397	427		
Sodium mg	21	12	1	35	5	2	21	7	6	2	3.8	2	7		
Zinc mg	3.18	2.77	2.40	2.21	1.68	3.97	3.30	2.02	3.73	4.16	4.3	2.63	5.96		
Copper mg	0.777	0.498	1.100	0.314	0.750	0.626	0.820	0.277	0.450	0.553	0.460	0.450	0.524		
Manganese mg	2.60	1.943	1.300	0.485	1.632	4.916	2.260	3.743	2.680	3.012	3.2	4.391	1.329		
Selenium mcg	-	-	8.3	15.5	2.7	-	<0.1	23.4	35.3	89.4	-	-	2.8		

All cereals and pseudo-cereal grains identified by a * are complete protein sources for adults, the amount of the limiting factor being greater than the need for it.

Seeds and Nuts

The information in this section is based on my own experienc and the following books: "Le régime Oméga", by Barry Sears (2003), "La vérité sur les Omega-3 ", by Dr Jean-Marie Bourre (2004), "Les huiles végétales pour notre santé", by Nathalie Cousin (2005), "Secrets des huiles de première pression à froid», by Bernard Stier (1990).

For vegans, raw seeds and nuts (see table on p. 17) are a good complement to some grains, which without them would not be a complete protein. But mostly because of their lipids content, they are one of our energy sources, and a privileged supply of essential fatty acids (EFA).

Lipids are composed of saturated fatty acids, monounsaturated fatty acids (Omega-9) and polyunsaturated fatty acids (Omega-6 and Omega-3). All polyunsaturated fatty acids (PUFA) are naturally curved in space in a *cis*-configuration, but are straightened into a *trans*-configuration under the influence of either partial hydrogenation to solidify fat as margarine, by cooking or by extraction of oil through a chemical process. In *cis*-configuration, hydrogen ions linked to carbon atoms are positioned on the same side of the double bond, while in *trans*-configuration, hydrogen ions move in space to the opposite side of the double bond.

Because our enzymatic system is only able to recognize the *cis*-configuration, it interprets *trans* -configuration as a saturated fat to be catabolized and put in reserve in our fat cells. Therefore it is very important to abstain from margarine and to cook without oil in a titanium non-stick pan, steamer or pressure cooker to keep the liver healthy. However it is a good idea to add first cold-pressed raw oil to our food when we are ready to eat to get our EFA in the *cis*-configuration.

Olive oil Omega-9 in *cis*-configuration becomes *trans* if heated at 70°C/150°F
Sunflower Omega-6 in *cis*-configuration becomes *trans* if heated at 55°C/131°F
Linseed, hemp or chia Omega-3 in *cis*-configuration becomes *trans* if heated at 45°C/113°F

The biochemistry of PUFA is difficult to understand as a lay person, but I try to make it as clear as possible so you can understand the importance of eating raw fat and not cooked fat.

A vegan diet rich in Omega-6 and poor in Omega-3 is perfectly all right.

Please look at the table below to understand the rest of this section.

Our 60 billion cell membranes are composed of PUFA, which isolate enzymes, proteins, carbohydrates, lipids content, and the nucleus genetic code from their surroundings. A cell membrane is more or less fluid and permeable. It releases eicosapentanoic acid (EPA) to detect modifications in external fluid to inform itself of needed adjustments. The more a cell membrane is made of unsaturated fat and the more fluid it is, the better it is, especially for brain neurons. This is why we find in the brain a lot of docosahexanoic acid (DHA) as an end-product of EPA biosynthesis.

The cells' microsomes produce enzymes that manage hormonal eicosanoid synthesis as prostaglandins (PG) from Omega-6 or 3. Gamma linolenic acid (GLA), coming from biosynthesis of Omega-6, produces PG-1. EPA coming from biosynthesis of Omega-3 produces PG-3. Both PG-1 and PG-3 have anti-inflammatory and pro-immune properties. They are considered "beneficial" because they fluidify blood, reduce extra cellular water, regulate the flow of hormones and neuromediators, as well as cardiac function. They also maintain cell membranes, protect the liver, and maintain vision and skin hydration.

Biosynthesis of Omega-6 and Omega-3

Omega-6	***desaturation and elongation enzymes***	**Omega-3**
C18 : 2n-6 **LA** **(linoleic acid)** ↓	**← delta-6-desaturase →**	**C18 : 3n-3** **ALA** **(α linolenic acid)** ↓
C18 : 3n-6 ***PG1*** ← **GLA** **(gamma linolenic acid)** ↓	**← elongase →**	**C18 : 4n-3** ↓
C20 : 3n-6 **DGLA** **(dihomo γ linolenic acid)** ↓	**← delta-5-desaturase →**	**C20 : 4n-3** **ETA** **(eicosatetranoic acid)** ↓
slow pathways: ***if Omega-6/Omega-3 =2/1 or less*** ***are in favour of production of AA ⟶PG2, EPA⟶ PG3*** ***and conversion from EPA to DHA and by retroaction from DHA to EPA***		
C20 : 4n-6 ***PG2*** ← **AA (arachidonic acid)** ↓	**← elongase →**	**C20 : 5n-3** → **EPA** → ***PG3*** ↑ **(eicosapentanoic acid)** ↓
C22 : 4n-6 ↓	**← elongase →**	**C22 : 5n-3** ↑ **DPA (docosapentanoic acid)** ↓
C24 : 4n-6 ↓	**← delta-6-desaturase →**	↑ **C24 : 5n-3** ↓
C24 : 5n-6 ↓	**← peroxysoale oxydation →**	↑ **C24 : 6n-3** ↓
C22 : 5n-6 **DPA (docosapentanoic acid)** →	**?peroxysoale oxydation? →EPA?**	↑ **C22 : 6n-3** **DHA (docosahexanoic acid)**
fast pathways: ***if Omega-6/Omega-3= 5/1 or more*** ***are in favour of production of DPA and DHA for the cellular membrane***		
C20 : 4n-6 **AA (arachidonic acid)** ↓	↓**← elongase →**	**C20 : 5n-3** **EPA (eicosapentanoic acid)** ↓
C22 : 4n-6 **DTA (docosatetranoic acid)** ↓	**←delta-4-desaturase →**	**C22 : 5n-3** **DPA (docosapentanoic acid)**
C22 : 5n-6 **DPA (docosopentanoic acid)**	**? delta-6 desaturase? →DHA?**	**C22 :6n-3** **DHA (docosahexanoic acid)**

Biosynthesis of Omega-6 also leads to arachidonic acid (AA), which is a precursor of PG-2, considered "bad" because it is pro-inflammatory, induces vasoconstriction and platelets aggregation and weakens the immune system.

AA is also a precursor of docosopentanoic acid (DPA), which has a similar effect as DHA in cell membranes. According to Claudio Galli, MD and Franca Marangoni, PHD in "*Recent Advances in the biology of n-6 fatty acids*" *(Nutrition Vol.13:978-985, 1997)*: " DPA is normally present in very low concentrations in most tissues…but it accumulates in plasma and tissues during Omega-3 deficiency…The reasons why DHA rather than DPA is esterified in cells are not dependent on the relative rates of conversion…since these have shown to be substantially the same." Also from the department of Physiology of university of Kuopio in Finland in "*Fatty Acid Composition of Erythrocyte, Platelet and Serum Lipids in strict Vegans" (Lipids, Vol.30, n°4, 1995),* researchers found that: "the increase of DPA (from biosynthesis of Omega-6) in vegans is probably a compensatory mechanism in response to the low levels of DHA (from the biosynthesis of Omega-3) in the diet".

Furthermore, according to Timothy J. Key in the *Proceedings of the Nutrition society (2006), 65, 35-41 "Health effects of vegetarian and vegan diets*": " Plant foods can provide Omega-3 but are devoid of the long-chain fatty acids EPA and DHA…Recently, it has been shown that plasma levels of EPA and DHA in vegans are not related to the duration of adherence to the diet over a period of =20 years, suggesting that the endogenous production of these fatty acids in vegetarians and vegans may result in low but stable plasma concentration ….conversion of Omega-3 to EPA and DHA can occur in human subjects but that the rate of conversion is low in females and very low in males…but there is no direct evidence that plasma levels of EPA and DHA in vegetarians can be substantially increased by following a diet low in linoleic acid (Omega-6) and high in alpha linolenic acid (Omega-3)". We need more research to judge the level or the lack of EPA, DHA and DPA in our cell membranes. The fact that our plasma blood level is low but stable in EPA, DHA and DPA doesn't mean our cell membranes are not full of it and that is where it should be!

All this suggests that as vegans we do not have to eat (and it is even better to abstain from) flaxseed, or hempseed or chia to get our Omega-3 because what is really needed is EPA and DHA and these are not the best way to get them. We produce our own EPA and DHA from Omega-6 either in our liver, as babies do, or directly in the smooth endoplasmic reticulum of our cells. In the previous table, I suggested some possible pathways (in the center column) to do so. But more research will be necessary to really understand how our vegan metabolism functions. For sure, something in our metabolism must have been adjusted because eating raw sunflower oil as a major source of fat, for more than 5 years, seems to be beneficial as we experience it in our Montreal "Vegan Gourmet Club".

Also in the article "*A novel omega3 fatty acid desaturase involved in the biosynthesis of eicosapentaenoic acid (EPA)" (Biochem J.2004 Mar 1; 378(Pt2):665-71),* we are told that *Saccharomyces cerevisiae* yeast, involved in the making of beer, wine and bread, synthesizes a desaturase enzyme that converts specifically AA (coming from Omega-6) into EPA (coming from Omega-3). My guess is that in the next ten years, science will discover other enzymatic mechanisms to transform DPA into DHA or DPA into EPA. The balance between Omega-6 and Omega-3 is far from being completely understood. We already know that biosynthesis chooses slower or faster pathways depending on the external environment of the cell condition, but most of all, on the proportion of Omega-6/Omega-3 in one's diet. Mother's milk has a proportion of Omega-6/Omega-3=7.2, so our diet should more or less reflect this model.

If the proportion is 2/1 or less, biosynthesis of Omega-6 and Omega-3 takes on slow pathways with alpha linolenic acid (ALA), using a delta-6-desaturase enzyme for its conversion to EPA and PG3 on one side and to DHA on another side. But by retroaction of a loop, this DHA is reconverted to EPA and more PG3.

Also by using up a delta-6-desaturase enzyme, ALA might disrupt the biosynthesis of PG1 from gamma linolenic acid (GLA), PG2 from AA and hence DPA production from Omega-6. Then the equilibrium between "good" PG1 and PG3 versus "bad" PG2 is compromised.

If the proportion is 5/1 or more, a superior limit is not important if we consider that DPA from Omega-6 has a similar effect as DHA in the case of limited access to Omega-3 in our diet. Biosynthesis of Omega-6 and Omega-3 takes faster pathways in the production of DPA and DHA for cell membranes by a currently unknown endogenous mechanism.

We should look for the modulation and equilibrium of opposite prostaglandins PG1 or PG3/PG2 (anti and pro-inflammatory) and not the suppression of bad PG2 for profit of good PG1 or PG3.

To prevent equilibrium going towards the bad side, our nutrition should be adjusted to prevent a large insulin production by eating too much sugar at one time, having too much stress-producing corticoid, or taking too much aspirin or other anti-inflammatory drugs. Ultimately slow or faster pathways depend on a balance between Omega-6/Omega-3 (2/1 or less and 5/1 or more) in our meals.

My assumptions are that the modulation of Omega-6 or Omega-3 biosynthesis represents a biochemical adaptation of different sources of PUFA according to different geographic locations. For example: Inuit, contrary to continental people, have a rich Omega-3 diet in *cis*-configuration and a poor diet in Omega-6, so Inuit die mostly from brain hemorrhages instead of cardiac crisis like the continental population, because they synthesize very little bad PG2, which enhances blood coagulation.

The more PUFA have a long chain, as with seeds and nuts, the more vulnerable they are to free radicals, which provoke oxidation by exposure to light, oxygen or heat, and result in a rancid taste and grayish appearance.

Buy raw seeds and nuts in bulk, directly from the producer, for the entire year and 1 or 2 months after harvest. Keep them in the freezer in a tight container.

Comments on Some Seeds and Nuts

Organic pumpkin seeds come from the species *Cucurbita pepo with naked seeds*. For a protein complement of 5g a day, eat 20g/2tbsp a day. At your wholesale dealer they usually arrive, at the end of February from China, in 55lbs in two vacuum packed plastic bags. Eat them raw or grind them in a coffee mill.

Non-pareil almonds come from California but producers use bee pollination and harvesting is quite brutal because they shake trees mechanically, which shortens their lifespan. So are they really ecovegan?

Organic hazelnuts are very difficult to get fresh from the current year's harvest. Producers tend to keep reserves for the "bad" years, which mean that if you buy them at your local organic store, you end up with "old" nuts, half rancid (*trans*) with a hollow center. Buy them directly from an organic producer if he can certify their freshness.

Organic California Walnuts have a bitter antinutrient in their brownish, protective outer layer. Soak them for 2 hours and discard the brown soaking water. Keep them in the freezer and a few at a time in the refrigerator for soaking. But overall, they undergo the same harvesting process as almonds. So are they really ecovegan?

All other types of nuts, salty or not, usually pass through a heating process. As a result, they should not be considered a source of proteins because their PUFA have gone from *cis* to *trans*-configuration. Eat them for fun in small quantities.

Poppy seeds can serve as a calcium supplement for kids and pregnant women or women with osteoporosis. For osteoporosis, besides taking poppy seeds as a calcium supplement, practice muscular exercise to put pressure on your bones so they will reinforce their strength and keep a good density. For this purpose, you should grind a 1/2 teaspoon/50mg at one time, 2 or 3 times/day for better absorption. Try to buy them fresh and keep them in the freezer.

Husked sunflower seeds come from China. You should apply the same precautions suggested for pumpkin seeds, but sunflower seeds are less nutritive and pastier when you grind them.

Whole sesame seeds contain a lot of phytosterols (714mg/100g), but as gomasio, mixed with flower sea salt, they make a nice salty condiment with traces of *trans*-fats. Too much phytosterols interfere with intestinal absorption of some antioxidants. Sesame seeds should be used only as a condiment.

Brown mustard seeds, ground and mixed with lemon juice or white wine (see Simple Staple Recipes p. 24) make a nice addition to vinaigrette or hot sauce.

Hemp seeds, flaxseeds or chia are not necessary as an Omega-3 supplement in a vegan diet. They are quite expensive and could even be detrimental to biosynthesis of other PUFA. They become rancid rapidly because of their high Omega-3 content and it is very difficult to verify the cold storage conditions they went through before you buy them at your local store.

Black sunflower seeds are used for the extraction of first cold-pressed oil. Because sunflower seeds are quite tender, heat produced during oil extraction is under 30°C, so this oil is completely exempt of *trans*-fat and its vitamin E content is preserved. Its content in Omega-6 (65.7g/100g) is plentiful but without Omega-3. Also this oil contains relatively few phytosterols (100mg/100g). As a daily fat supply, we recommend this oil raw, as long it is first cold-pressed quality.

Olive oil contains a lot of oleic acid or Omega-9 (72.5g/100g), some Omega-6 (7.9g/100g) and Omega-3 (0.6g/100g). Its content in phytosterols (221mg/100g) is moderately high. It gives a good taste to vegetables and vinaigrette, so you could use 50/50 sunflower oil and olive oil on a daily basis.

We do not recommend as a daily oil supply in a vegan diet:

-Safflower oil because it has a content of Omega-6 (74.6g/100g) and no Omega-3, similar to sunflower oil, but with a high content of phytosterols (444mg/100g).
-Soybean seed oil because contrary to sunflower seeds, soybean seeds are quite hard to press so their oil extraction generates at least a 50°C temperature. During the process their *cis*-PUFA have a good chance to become *trans.*
-Canola oil because it is derived from rapeseed and still contains some erucic acid, which is toxic for the liver in the long run. Otherwise its content in Omega-6 (20.3g/100g) and Omega-3 (9.3g/100g) is close to 2/1, and so is in favor of biosynthesis of a slow pathway.
-Coco oil because it is solid at room temperature and contains mainly saturated fat (86.5g/100g), which constitutes a good source of energy, but not of essential fatty acid (EFA). It can serve as a skin emollient in the winter.

Nutritive Content of Seeds and Nuts

Evaluation of Nutritive Content For 100g raw	**Hemp Seeds**	**Flax Seeds**	**Poppy Seeds**	**Pumpkin Seeds**	**Sesame Seeds, whole**	**Sunflower Seeds**	**Almonds, whole**	**Brazilnuts**	**Coconut**	**Hazelnuts, whole**	**Macadamia**	**Pecans**	**Pine Nuts**	**Pistachio, whole**	**Walnuts California Black**	**Needs per meal For a 60kg adult**	**Needs per meal For a 10-12 years old Or a 30-40kg child**
Water g	5.7	8.75	6.78	6.92	4.69	5.36	5.25	3.34	46.99	5.31	1.36	3.52	5.90	4.17	4.36		
Energy kcal	567	492	533	541	573	570	578	656	354	628	718	691	629	551	607		
Protein g	31	19.5	18.04	24.54	17.73	22.78	21.26	14.34	3.33	14.95	7.91	9.17	11.57	20.48	24.35		
Tryptophan g	0.350	0.297	**0.255**	0.431	0.388	0.348	0.192	0.260	0.039	0.193	0.067	0.093	0.146	0.276	0.322		
Rectified Tryptophan g	0.100	0.213	**0.255**	0.256	0.142	0.234	0.142	0.135	0.036	0.105	0.004	0.071	0.108	0.211	0.180	0.090	0.040-0.053
Methionine/Cystine g	0.380	**0.710**	0.923	**0.852**	0.944	0.945	**0.471**	1.363	0.128	0.498	0.030	0.335	0.417	**0.703**	0.941	0.300	0.220-0.293
Rect. Methion. /Cyst. g	0.333	**0.710**	0.850	**0.852**	0.474	0.780	**0.471**	0.450	0.122	0.350	0.015	0.239	0.362	**0.703**	0.600		
Phenylalanine/Tyrosine g	1.290	1.450	1.563	2.241	1.683	1.835	1.678	1.203	0.272	1.025	1.176	0.641	0.867	1.493	1.856		
Rect. Phenyl. /Tyro. g	0.533	1.136	1.356	1.363	0.758	1.249	0.753	0.721	0.196	0.560	0.024	0.382	0.579	1.125	0.961	0.480	0.220-0.293
Lysine g	**0.400**	0.862	1.099	1.833	**0.569**	**0.937**	0.601	**0.541**	**0.147**	**0.420**	**0.018**	**0.287**	**0.434**	1.162	**0.721**		
Rectified Lysine g	**0.400**	0.855	1.020	1.026	**0.569**	**0.937**	0.567	**0.541**	**0.147**	**0.420**	**0.018**	**0.287**	**0.434**	0.847	**0.721**	0.360	0.440-0.587
Lipids g	47	34	44.70	45.85	49.67	49.57	50.64	66.22	33.49	60.75	75.77	71.97	60.98	43.19	56.58		
Satured fatty acids g	5	3.196	4.870	8.674	6.957	5.195	3.881	16.154	29.698	4.464	12.061	6.175	9.377	5.286	3.628		
18 :1 Omega-9g	6	6.868	6.710	14.14	18.52	9.356	31.92	22.382	1.425	45.40	43.756	40.595	21.52	22.05	11.85		
18 :2 Omega-6g	28	4.318	30.49	20.70	21.37	32.63	12.21	23.807	0.366	7.833	1.296	20.629	24.88	12.83	33.46		
18 :3 Omega- g	9	18.12	0.330	0.181	0.376	0.069	0	0.062	0	0.087	0.206	0.986	0.78	0.247	3.306		
Carbohydrates g	11	34.25	23.69	17.81	23.45	18.76	19.74	12.80	15.23	16.70	13.82	13.86	19.30	29.19	12.10		
Fibers g	6	27.9	10	3.9	11.8	10.5	11.8	5.4	9.0	9.7	8.6	9.6	10.7	10.0	5		
Calcium mg	79	199	1448	43	975	116	248	176	14	114	85	70	8	107	58		
Iron mg	9.4	6.22	9.39	14.97	14.55	6.77	4.29	3.40	2.43	4.70	3.69	2.53	3.06	4.27	3.07		
Magnesium mg	-	362	331	535	351	354	275	225	32	163	130	121	234	121	202		
Phosphorus mg	-	498	849	1174	629	705	474	600	113	290	188	277	35	490	464		
Potassium mg	-	813	700	807	468	689	728	600	356	680	368	410	628	977	524		
Sodium mg	9	30	21	18	11	3	1	2	20	0	5	0	72	1	1		
Zinc mg	-	4.17	10.23	7.46	7.75	5.06	3.36	4.59	1.10	2.45	1.30	4.53	4.28	2.20	3.42		
Copper mg	-	1.041	1.633	1.387	4.082	1.752	1.110	1.770	0.435	1.725	0.756	1.200	1.035	1.300	1.020		
Manganese mg	-	3.281	6.833	3.021	2.460	2.020	2.535	0.774	1.500	6.175	4.131	4.500	4.333	1.200	4.271		
Selenium mcg	-	5.5	1.6	5.0	5.7	59.5	7.9	2960.0	10.1	4.0	3.6	6.0	-	7	17		
Phytosterols mg	-	-	89	-	714	534	120	-	47	96	116	102	-	214	-		

Vegetables and Fruits

The information in this section is based on my own experience and the following two books: "Équilibre psychobiologique et oligo-éléments", by Dr Carl C. Pfeiffer and Pierre Gonthier (1988) and "L'alimentation antioxydante", by Serge Rafal (Marabout 2001b).

Vegetables and, to a lesser degree, fruits are essential for their diversity in mineral elements, vitamins and antioxidants (see table on p. 21). But mainly it is vegetables and spices that bring a gourmet touch to our legumes and cereal proteins- for their taste, color and texture diversity. Contrary to vegetables, fruits are mostly for pleasure and not essential for our vegan health. We can also celebrate seasons year-round by eating vegetables and fruits as they arrive on our local market. Always buy them organic to prevent absorbing pesticides and chemical fertilizers that demand a lot of antioxidants to be detoxified.

As vegans, it is difficult to know our real needs for minerals, trace elements, vitamins and antioxidants because no valuable scientific research has been done. For sure, our needs are lower than those of omnivores because our herbivore metabolism is more effective. The best way to know if we have any deficiencies is to check our vital energy level and appearance of our skin, nails and hair. After 10 years of being ecovegan and following this document's guidelines with no supplements, I consider myself in good health, as do the five other members of our little "Vegan Gourmet Club".

A. Minerals

Minerals as macro, micro and trace elements are present in our body in various quantities. They come from the soil through plants, water and unrefined flower sea salt. Plants absorb soil minerals according to soil availability and their genetic code. As a result, their contents are different from one plant to another, even if they grow in the same soil. Also, minerals activate some hormones (iodine for thyroxin, chrome for insulin, etc.) and are part of some vitamins like B^{12}. The interaction between all of these different minerals is very complex. Macro- elements (hydrogen, carbon, nitrogen, oxygen, phosphorus, sulfur and chloride) form 98% of our bodyweight while micro-elements form 1.89% and are the four electrolytes that maintain pH equilibrium and osmotic pressure in healthy limits: potassium, sodium, calcium and magnesium. Finally trace elements are 0.012% of our bodyweight, but are nevertheless very important because they act as co-factors for biosynthesis of all kind of enzymes, proteins and so forth...

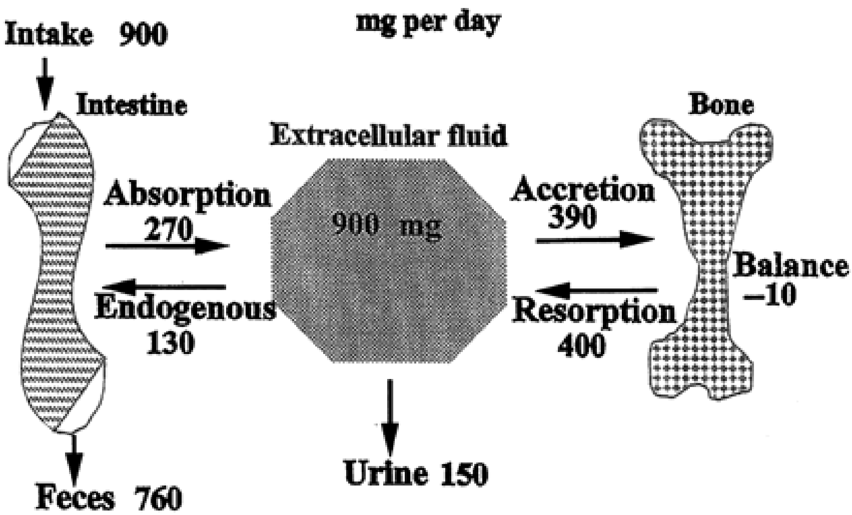
According to *www.surgeongeneral.gov/library/bonehealth/docs/OsteoBrochure1mar05.pdf*, adult's ages 18-50 years old need 1000mg/day of calcium and 400I.U. vitamin D/day and adults ages 50 + year's old need 1200mg/day of calcium + 400-600I.U. vitamin D/day. In this brochure, nothing states that these requirements are for omnivores eating lots of animal proteins and having a lot of acidity to counterbalance with their calcium/magnesium intakes. If we choose to follow this guideline, we need to either take a calcium supplement or eat calcium-supplemented foods or a lot of tofu made with calcium chloride. This is not a good way to promote a vegan diet! We know that in African countries where the diet is mostly vegetarian, with very little dairy products, women consume 300-400 mg calcium/day at most and have much less osteoporosis than most American women!

Vegans need only 200-300mg calcium/day to maintain good bone density.

For calcium metabolism it is important to eat this mineral in small quantity to avoid triggering hyper (too much) or hypo (too little) calcium blood level. If we absorb calcium in two or three times/day- at breakfast, lunch and dinner- we could prevent intestinal losses. This quantity is quite easy to obtain in a vegan diet, without any supplements!

In case of a hyper condition, a self-regulatory system excretes this surplus of calcium in the third part of the small intestine (ileum) to maintain normal calcium blood levels to prevent tetany or tachycardia. An omnivore absorbing 900mg of calcium/day excretes 910mg, with a resulting bone loss of 10mg/day. See: "*Bioavailability of Dietary calcium*", by *Léon Guéguen and Alain Pointillart* in the *Journal of the American College of nutrition, Vol19, No.2, 119S-136S (2000)* and its schema below.

Calcium Metabolism in Omnivores



Calcium absorption is complex and can occur in the absence of vitamin D by passive absorption. Plants in general contain very little vitamin D as D^2 (D^3 comes from animal products), so as vegans, we must get our vitamin D from sunlight exposure 20min/day, 3-times a week, even in winter.

Why Do Vegans Need Less Calcium? Due to the fact that vegans eat no animal proteins and in general fewer proteins than do omnivores, their overall acidification is lower. Their acid-base equilibrium is reached more from the interaction of potassium/sodium than from the interaction of calcium/magnesium, as is the case for omnivores. Also the less calcium we eat, the more we retain it and the less we reject it because of parathyroid hormone (PTH) action. More research in this area is needed to confirm these statements.

In order to reach our acid-base equilibrium, we should maintain a good potassium/sodium ratio. This ratio should be around 3 as in maternal milk (51mg of potassium for every 17mg of sodium). Because vegans eat a lot of plants, they absorb proportionally more potassium than sodium. Also magnesium is quite abundant in plants and is essential to potassium retention by the kidneys.

Vegans need to eat a minimum of 2000mg potassium/day, which means that a minimum of 670mg of sodium/day is necessary. I recommend eating unrefined sea salt of the highest quality like Atlantic flower sea salt in the right quantity (1/8 teaspoon =750mg). This flower sea salt has 81 mineral elements besides sodium and tastes great. Usually vegans do not have problems with cholesterol or high blood pressure, so eating the right amount of flower sea salt is necessary to reach acid-base equilibrium. But flower sea salt is so delicious, be aware of addiction!

The requirements for all the minerals are easily met by a vegan diet if you follow this document's guidelines.

However the absorption of iron, calcium and other minerals might be compromised by bonding with the phytic acid present in cereals and legumes. To avoid that, we just have to chew our food well. Our saliva activates a phytase enzyme present in plants, which allows minerals to be free from that bond.

However, you should know that:

- Too much calcium, iron or copper inhibits zinc absorption.
- Too much tea or coffee inhibits zinc absorption.
- Crucifers, such as cabbage and broccoli, should be cooked to destroy the thyroid inhibitor factor. Although a small raw red cabbage salad is quite all right for our health. It is simply a question of quantity!
- It is better to eat in-season, ripened fruits that are peeled (to avoid eating the anti-nutrient factor that is naturally present in their skins) than juice. The pulp fibers of the whole fruit prevent a sudden unwanted production of insulin in response to absorbed fructose.

Vegetables contain more vitamins and minerals than do fruits. Eat fruits for pleasure with moderation.

B. Vitamins

Plants contain all of the hydro-soluble B vitamins except B^{12}. However, all complex B vitamins are synthesized by vegan-friendly bacteria colonies in the second part of the small intestine (jejunum). Some bacteria-like *Pseudomonas* and *Klebsiella,* in lesser quantity, synthesize B^{12} in the presence of cobalt. If synthesized B^{12} can combine with the intrinsic factor, produced by the stomach's mucosa and present in the jejunum, it can be absorbed by the third part of the small intestine (ileum). It is very easy to harbor these vegan-friendly bacteria because they are so common in soil and water. If they invade beyond our intestines, our blood and overall body, they are considered to be pathogens. This indicates that our immune system is weak. Otherwise they are considered normal inhabitants of our intestines and are quite resistant to antibiotics, but not to yeast!

For optimal B^{12} bacterial synthesis, do not eat yeasts or drink chlorinated water.

If you are a city dweller and drink tap water, you can filter your water and/or fill a glass bottle and put it in the refrigerator without a cap for a few hours so that the chlorine can evaporate. Yeast is known for their ability to overcome bacterial growth in the small intestine. Thus, it is best to avoid bread produced with yeast, although we can eat sourdough bread in small quantities at each meal (no more than two slices, 1/2 inch thick) because it has a slower rate of growth than baker's yeast. Bacteria usually feed on cellulose fibers, which we cannot digest. Therefore we have a convivial partnership with these vegan friendly bacteria. See: *"Vitamin B12 synthesis by human small intestine bacteria", by M.J. Albert, V.I. Mathan and S.J. Baker in Nature Vol: 283 p.781-782 (1980).*

Nutritive Content of 39 vegetables and 9 fruits

Evaluation of Nutritive Content In 100g/raw	Energy kcal	Protein g	Lipid g	Carbohydrate g	Fiber g	Calcium mg	Iron mg	Magnesium mg	Phosphorus mg	Potassium mg	Sodium mg	Zinc mg	Copper mg	Manganese mg	Vitamin C mg	Vitamin A IU
Apples, without skin	57	0.15	0.31	14.84	1.9	4	0.07	3	7	113	0	0.04	0.031	0.023	4.0	44
Arugula	25	2.58	0.66	3.65	1.6	160	1.46	47	52	369	27	0.47	0.076	0.321	15	2373
Artichoke	47	3.27	0.15	10.51	5.4	44	1.28	60	90	**370**	**94**	0.49	0.231	0.256	11.7	185
Asparagus	23	2.28	0.20	4.54	2.1	21	0.87	18	56	273	2	0.46	0.176	0.262	13.2	583
Avocados	161	1.98	15.32	7.39	5.0	11	1.02	39	41	599	10	0.42	0.262	0.226	79	612
Beets	43	1.61	0.17	9.56	2.8	16	0.80	23	40	**325**	**78**	0.35	0.075	0.329	4.9	38
Blackberries	52	0.72	0.39	12.76	5.3	32	0.57	20	21	196	0	0.27	0.140	1.291	21	165
Blueberries	56	0.67	0..38	14.13	2.7	6	0.17	5	10	89	6	0.11	0.061	0.282	13	100
Bok-choï	13	1.50	0.20	2.18	1.0	105	0.80	19	37	**252**	**65**	0.19	0.021	0.159	45	3000
Broccoli	28	2.98	0.35	5.24	3.0	48	0.88	25	66	325	27	0.40	0.045	0.229	93.2	1542
Cabbage, collards	30	2.45	0.42	5.69	3.6	145	0.19	9	10	169	20	0.13	0.039	0.276	35.3	3824
Cabbage, green	25	1.44	0.27	5.43	2.3	47	0.59	15	23	246	18	0.18	0.023	0.159	32.2	133
Carrots	43	1.03	0.13	10.14	3.0	27	0.50	15	44	323	35	0.20	0.047	0.142	9.3	28129
Celeriac	42	1.50	0.30	9.20	1.8	43	0.70	20	115	**300**	**100**	0.33	0.070	0.158	8.0	0
Celery	16	0.75	0.14	3.65	1.7	40	0.40	11	25	**287**	**87**	0.13	0.034	0.102	7	134
Chard, Swiss	19	1.80	0.20	3.74	1.6	51	1.80	81	46	**379**	**213**	0.36	0.179	0.366	30	3300
Chayote	19	0.82	0.13	4.50	1.7	17	0.34	12	18	125	2	0.74	0.123	0.189	7.7	56
Cilantro	24	2.02	0.48	4.34	2.8	67	1.68	26	54	510	54	0.05	0.225	0.426	35.3	6130
Dandelion	45	2.70	0.70	9.20	3.5	187	3.10	36	66	397	76	0.41	0.171	0.342	35	14000
Dates	275	1.97	0.45	73.51	7.5	32	1.15	35	40	652	3	0.29	0.288	0.298	0	50
Eggplant	26	1.02	0.18	6.07	2.5	7	0.27	14	22	217	3	0.14	0.055	0.130	1.7	84
Endive	17	1.25	0.20	3.35	3.1	52	0.83	15	28	314	22	0.79	0.099	0.420	6.5	2050
Fennel	31	1.24	0.20	7.29	3.1	49	0.73	17	50	414	52	0.20	0.066	0.191	12	134
Figs, dried	255	3.05	1.17	65.35	12.2	144	2.23	59	68	712	11	0.51	0.313	0.388	0.8	133
Kale	50	3.30	0.70	10.01	2.0	135	1.70	34	56	447	43	0.44	0.290	0.774	120	8900
Lettuce, romaine	14	1.62	0.20	2.37	1.7	36	1.10	6	45	290	8	0.25	0.037	0.636	24	2600
Leeks	61	1.50	0.30	14.15	1.8	59	2.10	28	35	180	20	0.12	0.120	0.481	12	95
Mushroom, Pleurote	37	4.14	0.51	6.22	2.4	6	1.74	20	141	516	31	0.78	0.363	0.142	0	48
Mushroom, Portobello	26	2.50	0.20	5.07	1.5	8	0.60	11	130	484	6	0.60	0.400	0.142	0	0
Mushroom, White	25	2.90	0.33	4.08	1.2	5	1.04	10	104	370	4	0.73	0.492	0.112	2.3	0
Onions	38	1.16	0.16	8.63	1.8	20	0.22	10	33	157	3	0.19	0.060	0.137	6.4	0
Parsley	36	2.97	0.79	6.33	3.3	138	6.20	50	58	554	56	1.07	0.149	0.160	133	5200
Parsnips	75	1.20	0.30	17.99	4.9	36	0.59	29	71	375	10	0.59	0.120	0.560	17	0
Pears, without skin	59	0.39	0.40	15.11	2.4	11	0.25	6	11	125	0	0.12	0.113	0.076	4.0	20
Pineapple	49	0.39	0.43	12.39	1.2	7	0.37	14	7	13	1	0.08	0.110	1.649	15.4	23
Potatoes	79	2.07	0.10	17.98	1.6	7	0.76	21	46	543	6	0.39	0.259	0.263	19.7	0
Radishes	20	0.60	0.54	3.59	1.6	21	0.29	9	18	232	24	0.30	0.040	0.070	22.8	8
Raisins	300	3.22	0.46	79.13	4.0	49	2.08	33	97	751	12	0.27	0.309	0.308	3.3	8
Raspberries	49	0.91	0.55	11.57	6.8	22	0.57	18	12	152	0	0.46	0.074	1.013	25	130
Shallots, French	72	2.50	0.10	16.80	-	37	1.20	21	60	334	12	0.40	0.088	0.292	8	1190
Spinach	22	2.86	0.35	3.50	2.7	99	2.71	79	49	558	79	0.53	0.130	0.897	28.1	6715
Squash, Butternut	45	1.00	0.10	11.69	-	48	0.70	34	33	352	4	0.15	0.072	0.202	21	7800
Squash, Zucchini	21	2.71	0.40	3.10	1.1	21	0.79	33	93	459	3	0.83	0.097	0.196	34.1	490
Sweet pepper, red	27	0.89	0.19	6.43	2.0	9	0.46	10	19	177	2	0.12	0.065	0.116	190	5700
Sweet potatoes	105	1.65	0.30	24.28	8.0	22	0.59	10	28	204	13	0.28	0.169	0.355	22.7	20063
Tomatoes	21	0.85	0.33	4.64	1.1	5	0.45	11	24	222	9	0.09	0.074	0.105	19.1	623
Turnips	27	0.90	0.10	6.23	1.8	30	0.30	11	27	**191**	**67**	0.27	0.085	0.134	21.0	0
Yam	118	1.53	0.17	27.89	4.1	17	0.54	21	55	816	9	0.24	0.178	0.397	17.1	0

As vegans, we have a choice of either getting our B^{12} through friendly bacteria or getting it in pills or supplemented food, such as yeast or enriched soybean drinks (but we already know that it is better to avoid soybean products). In “*Veganism, Clinical Findings and Investigations”*, by *Frey R. Ellis and V.M.E. Montegriffo* in *The American Journal of Clinical Nutrition Vol.23, No3, March 1970 pp.249-255,* it states that: “The four vegans who had been on the diet for 13 years and longer, with no supplementary vitamin B^{12}, had normal serum B^{12} levels and were possibly absorbing intestinal synthesized vitamin B^{12}. Another explanation could be that they maintain a natural enterohepatic circulation of vitamin B^{12} and economize their small body store, although it seems unlikely that this could maintain a serum B^{12} for as long as 13 years”.

If we abstain from yeast, vegan B^{12} insufficiency is mostly due to the lack of stomach intrinsic factor. A lack of intrinsic factor production is often caused by diminished stomach acidity or a genetic factor.

A vegan diet and our friendly intestinal bacteria easily fulfill our requirement for all vitamins.

C. Enzymes

**Enzymes are proteins and produced in our cells according to their DNA encoding.
Enzymes need co-enzymes to facilitate the activation and regulation of cell metabolism.
Most minerals and vitamins serve as co-enzymes.**

Contrary to most raw-foodists’ dogma, we do not have an enzyme reserve that we are born with and that declines as we get older.

This raw diet dogma, first proclaimed at the end of the 19^{th} century, is completely false from a modern and scientific point of view! Our body synthesizes more than a thousand different enzymes each day and all from essential amino acids (EAA) to form protein. All enzymes end with the suffix “*ase”* and the prefix indicates their role, for example *oxydase* is an enzyme that provokes oxidation. When we eat raw, the vegetable enzyme content remains intact until it hits the second and more acidic part of the stomach. The stomach acidity then digests these protein enzymes as any other protein. So the first part of the small intestine (duodenum) have to receive the pancreatic enzymes to facilitate the digestion of raw or cooked proteins, carbohydrates and lipids, with the help of biliary salts produced by the liver.

During my one year of eating 100% raw food, I experienced an increased level of energy, not because I was eating a lot of enzymes, but, as mentioned previously, because I was not eating cooked fat of any kind, which transforms a *cis*-configuration into a *trans*-configuration! Raw foodists also claim that cooked food provokes a transitory and higher level of white blood cells, which is not the case with raw food. But this should not cause alarm because it is simply a normal and temporary physiological response from our immune system; a similar phenomenon occurs right after jogging or muscular exercise!

Raw food is fine for people living in the south, with access to ripe fruit and fresh nuts all year.

For more northern populations, a 50% ratio of raw, to prevent destruction of some vitamins (C and E) affected by a heat process, and a 50% of cooked food is more appropriate. However, to get enough essential amino acids (EAA), 100% raw food offers less choice if we abstain from eating sprouted raw legumes (as stated in the Legumes section). Plus it is quite difficult to get access to fresh nuts all year.

D. Antioxidants

Our body is composed of cell membranes rich in polyunsaturated fatty acids (PUFA) that are responsible for the quality of exchange between a cell's interior and its surroundings. Cells react to a more or less aggressive environment by oxidation, causing the release of free radicals. To counteract these free radicals, the cell produces antioxidants. Our health relies on maintaining a fine equilibrium between the free radicals and the antioxidants. This equilibrium seems more difficult to reach as we get older, but we do not know if this is also true for elderly vegans because of a lack of scientific evidence. A vegan diet, naturally having fewer calories than an omnivorous diet, could delay ageing.

Cell membranes are made of molecules. Molecules are made of atoms surrounded by electrons, normally in pairs. When, for whatever reason, physiological or not, these molecules are attacked, they react by an oxidative process with free radicals as end products. These molecules momentarily acquire an odd-number of electrons, becoming unstable and aggressive toward their surroundings in an attempt to re-establish their atomic equilibrium. This usually provokes a domino effect, but antioxidants prevent it by blocking this chain reaction. The production of free radicals results from environmental adjustments such as: car and atmospheric pollution, too much sun exposure, x-rays, herbicides, pesticides, food preservers, deodorant, paint lacquer, alcohol, tobacco, chlorinated tap water with heavy metal, drugs, too much iron absorption (having a deleterious effect on arteries), or a high stress level.

The internal production of free radicals is mainly normal, as result of our pulmonary and cellular respiration. They play an important role in defending us against viruses and bacteria.

If we produce too many free radicals, we need to produce more antioxidants, which are:

- Internal production of a triple enzymatic system: superoxyde dismutase (SOD) requiring manganese, copper or zinc, a catalase requiring magnesium and glutathione peroxydase (GPO) requiring selenium.

- External diet supply: vitamin E from first-cold-pressed oil or fresh seeds and nuts; lycopen; beta-carotene; lutein; vitamin A and C; and minerals, such as selenium, zinc, magnesium, copper and manganese from various colorful vegetables and fruits.

The absorption of alpha and beta carotene, lycopen and vitamin E is diminished by the presence of too many phytosterols.

See: www.pdrhealth.com/drug_info/nmdrugprofiles/nutsupdrugs/phy_0205.shtml

We believe some foods contain too many phytosterols/100g, such as: sesame seeds (714mg), sunflower seeds (534mg), pistachios (214mg), cashews (158mg), safflower oil (444mg), soybean oil (250mg). Other foods are acceptable in small quantity, such as: olive oil (221mg) and walnut oil (176mg).

It is better to choose hazelnuts (96mg) or almonds (120mg) and sunflower oil (100mg). Up to now we do not have data for pumpkin seeds but the kinesiology tests that have been conducted on them have generated positive results. Kinesiology test or muscle testing, commonly used in alternative medicine, checks your muscular resistance to various products in order to determine which ones are good for you.

Simple Staple Recipes

How to prepare your legumes properly

1. **Sorting**: If required to remove stones & debris.

2. **Rinsing**: All legumes need to be thoroughly rinsed in a colander under running tap water.

3. **Soaking of beans and chickpeas**: Use 8 cups of water for 2 cups of legumes. Soak 48 hours, similar to sprouting. Rinse and change the water every 12 hours. Do not add salt during soaking or cooking, as salt affects the process. Once the soaking is complete, discard the water, which contains all of the antinutrient factor purines, and rinse well.

4. **Soaking of lentils and flageolet beans**: Use 4 cups of water for 1 cup of legumes. Soak 24 hours. Rinse and change the water every 12 hours.

5. **Soaking of coral lentils and split peas**: Not necessary.

6. **Cooking lentils and split peas in a large pot**: Combine 200g (1 cup) with 4 cups of cold water in a large pot. Bring to a boil for 5 minutes and skim foamy impurities. These legumes contain fewer lectins. Drain the water and rinse well. Change the water and bring it to a boil again for 45 minutes.

7. **Cooking beans and chick peas in a pressure cooker**: Combine 2 cups (400g) of beans, previously soaked for 48 hours, with 6 cups of cold water. Bring pressure cooker to steam pressure and cook on medium heat for 25-45 minutes, depending on the kind of beans, their freshness and the desired texture. Release pressure by placing the pressure cooker under cold tap water. Open the cooker and drain the beans, discarding the cooking water to eliminate lectins. Store well-drained beans in a glass dish in the refrigerator or freezer. Adjust cooking time to 20 minutes only for flageolet beans.

Note: *For better digestion and a finer texture of chickpeas, puree legumes using a food mill, or peel them by hand once cooked to eliminate excess fiber.*

Note: *A pressure cooker is recommended to cook beans and chickpeas for tenderness, speed and energy savings. However, a pressure cooker is not recommended to cook lentils and split peas, which mash easily and may clog up safety valve.*

Good to know: *2 cups (400g) of raw legumes make 6 cups of cooked legumes. Therefore 1 cup equals 66g of legumes yielding 15g of proteins. This adequately fulfills the essential amino acids (EAA) requirements for a meal for a 60kg adult or a child.*

Legume Purée (for 2)

In a food processor, blend 2 cups of cooked chickpeas, beans or lentils. Add 2 cups of cooked vegetables (Ex. celery, butternut squash, onions, and leeks), spices and flower sea salt. Warm up the purée in a 300^{o}F pre-heated oven for 15-20 minutes and broil for 3-5 minutes. Let it cool a little bit and add a raw sunflower oil on top just before serving. To prepare cream or soup, add more water/vegetable broth to the mixture to obtain the right consistency.

Pumpkin Seed Spread (for 2)

In a medium bowl, combine 2 tablespoons (20g) of ground pumpkin seeds (using a coffee grinder) with flower sea salt and spices. For different spread combine 1 ripe avocado, or well-cooked broccoli florets, or tomato purée with a little agave syrup or apple butter and stir with a fork.

Hummus (*Keeps 1 week in refrigerator)*

In a food processor, combine the following ingredients and process to obtain a smooth purée:
1 cup cooked and peeled chickpeas, beans or lentils
1 tablespoon onion powder
3 tablespoons oil
2-3 tablespoons water
1 teaspoon balsamic vinegar or lemon juice
1 teaspoon home-made mustard
1/2 teaspoon garam masala or other spice to taste
1/8 teaspoon flower sea salt
Freshly ground Italian spices to taste

Mayonnaise

In a food processor, combine the following ingredients and process to obtain a creamy mixture:
3 tablespoons lemon juice
6 tablespoons sunflower oil
4 tablespoons (40g) pumpkin seeds ground in a coffee grinder
1/2 teaspoon garlic flower
1/2 cup parsley leaves finely chopped (no stems) for a nice green color, which does not oxidize
1/4 teaspoon home-made mustard
1/8 teaspoon flower sea salt

For a more liquid result, add more water or white wine until appropriate consistency is obtained.

Hulled Barley (for 2)

Rinse and soak 8oz (200g) of hulled barley for 24 hours. Drain in a colander. Combine with 3 cups of cold water in a pressure cooker. Close and bring to steam pressure. Cook on medium heat for 30 minutes. Release the pressure by placing the cooker under cold tap water. Open and drain the hulled barley.

Hulled barley keeps well in the refrigerator for 4-5 days in a tightly closed glass container.

Buckwheat (for 2)

Bring 12oz of water to a simmer. Rinse 1 cup (200g) of white buckwheat. Add the buckwheat to hot water (if the water is boiling, the buckwheat will pop). Bring to a boil. Cover and reduce the heat to minimum. Cook for 15 minutes. Remove the lid and keep cooking until all of the water has evaporated. Add a dash of sunflower oil when serving and mix well with a fork to fluff it.

The grain will pop open and become sticky if using a pressure cooker. Although this is not required for this recipe, this may be of use when preparing a pudding.

Wild Rice (for 2)

Under cold tap water, rinse 1 cup (150g) of wild rice. Combine it, in pressure cooker, with 4 cups (960cc) of cold water. Bring it to a boil, then secure the lid. Bring the steam pressure and cook under medium heat for 35 minutes. Remove from heat and let the pressure slowly fall until the pressure cooker valve is released to let the wild rice soak up the remaining moisture. If necessary, drain the excess water.

Quinoa (for 2)

Because some of the bitter saponin covering on the grain can still be present, even though most quinoa is washed before being sold, you should thoroughly rinse the dry grain until the water runs clear. Combine 1 cup of quinoa with 2 cups of water and simmer for 15 minutes or until tender. For a nuttier taste, toast quinoa in a hot dry pan for about 5 minutes after rinsing and before cooking.

Pastry Dough

Place 9oz (120g) of barley flour in a medium-sized pie pan (9” or 23cm). Make a hole in the centre of the flour and pour 2oz (30cc) of sunflower oil, 2oz (60cc) of water and a dash of flower sea salt. Combine with a fork first, then with your hands all ingredients directly in the pie pan. Because the dough does not roll out easily, it is recommended to spread it evenly in the pan by hand. Cook the crust for 10 minutes at 350^{o}F. This crust can be used as a base for salty or sweet pies. Barley is a complete protein. Its texture and taste is sweeter than Kamut, which is perfect for pastry. This pie recipe is only for special occasions because you will eat some cooked oil or *trans*-fat.

Garlic Flower (Preserve to be prepared at Summer Solstice)

In a food processor, cut washed and dried garlic flower in 3cm chunks. Remove the parts that are too tough. Add 3 tablespoons of sunflower oil, 1 tablespoon of lemon juice, and 1 teaspoon of flower sea salt. Then process it. Fill 3oz (90cc) glass containers with the mixture. Keep containers in the freezer when not using, and one in the refrigerator for daily usage. Plan to use approximately 1 or 2 containers per month. Ready to use, garlic flower is full of fragrance and has a delicate taste.

Gomasio

In a frying pan, dry-toast 4oz of whole sesame seeds for 3 minutes at medium-high temperature. Once golden, let the seeds cool down. Grind the seeds in a coffee grinder for 5-10 seconds with a 1/4 teaspoon of flower sea salt. Store it in the refrigerator.

Home-Made Mustard

In a coffee grinder, grind 2oz (50g) of Canadian mustard seeds with 1/4 teaspoon of flower sea salt. In a food processor, combine 3oz (90cc) of white wine or lemon juice and ground mustard seeds. Process until the mixture is creamy. Mustard should be stored in a jar in the refrigerator. This mixture thickens after 24 hours.

A Résumé: The Daily Essentials

1. **All food should be organic to be ecovegan.**
2. **Eat approximately a 50/50 ratio of raw and cooked vegetables.**
3. **Each meal (twice a day for adults and three times a day for children) should contain a protein source (legume or cereal) with a limiting factor that fulfills the requirement for the same essential amino acid. Choose wisely among legumes and cereals in the tables on p.6 & 11.**
4. **Soak and cook your own legumes instead of relying on canned food.**
5. **Buy for the year your pumpkin seeds in February -March and your nuts in November-December right after their harvest and directly from the producer. Keep them in the freezer, with a small quantity in the refrigerator for daily use.**
6. **For a salty taste, buy flower sea salt harvested in the Atlantic sea, which naturally contains iodine.**
7. **Eat a lot of vegetables, especially crucifers (cabbages) for their calcium content, but, if necessary, with some flower sea salt to equilibrate their usually high potassium content.**
8. **For their zinc content eat 2 tablespoons of fresh pumpkin seeds, whole for breakfast or ground to sprinkle on top of your meal to serve as a protein complement of your meal.**
9. **Use first cold-pressed sunflower oil, as a primary source of fat or 50/50 with first cold-pressed virgin olive oil.**
10. **Abstain from cooked oil and heated processed nuts or seeds coming from faulty storage condition. Eat pastry on occasion only.**
11. **Abstain from all kind of yeast to protect your intestinal bacterial flora that produces your vit B^{12}.**
12. **Eat Kamut: noodles, sourdough bread or flat bread for their complete protein contents.**
13. **Abstain from soybean by-products for their phytoestrogen content and their tendency to lead to addiction and allergy.**

If after following these simple guidelines for 2-3 years you are interested in becoming a voluntary subject for further scientific research (researchers will simply take a few blood samples and ask you to fill out some questionnaires) or if you need any further explanation, please contact me at:
francoisehebrard@yahoo.ca.

Thank You!