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# NUTRITION DURING PREGNANCIES

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### INTRODUCTION

Pregnancies are periods during which the individual tends to pursue a healthy lifestyle from which both the mother and the newborn may obtain benefits. More specifically, an adequate nutritional plan represents a good starting point for an easy pregnancy. Diets are one of the environmental factors which can significantly influence the mother's health and the future growth and development of the fetus both during the pre-conception period (when the individual isn't thinking about a pregnancy yet) and during the pregnancy itself.

The pre-conception phase is a part of the longer period known as the peri-conception phase which is composed of: the pre-conception phase, the conception, the implantation of the fecundated egg in the mother's uterus, the placentation (the formation of the placenta and of the annexes which will contribute to the correct nutrition of the fetus) and the embryo-genesis (the formation and development of the embryo). This period, although brief if compared to the entire duration of the pregnancy, is fundamental for the subsequent development of the fetus. A correct nutritional plan during this period influences the fertility and the first phases of the pregnancy. It is also important for the continuation of the pregnancy because it allows for the satisfaction of the changes in the energetic needs of the mother and it provides the fetus with the nutritional elements it needs for its development in order to become a healthy newborn.

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The following graph renders the comprehension of the above explanation easier

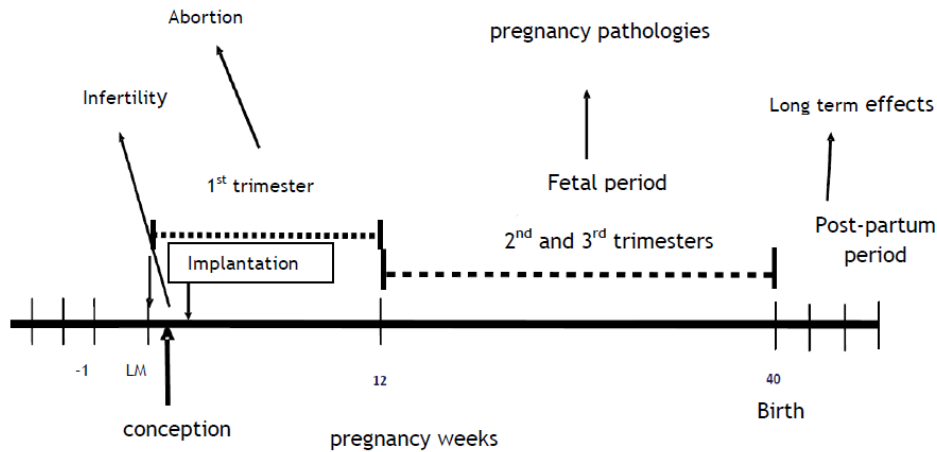


Fig. 1

The graph represents the various phases of the pregnancy, from the pre-conception period to the post-partum period. In every phase, alterations in the fetal development may occur. The pre-conception period, the conception, the implantation and the embryogenesis constitute stages of the peri-conception period which is a critical part of the development of the fetus. (Source: Cerin et al. 2010).

LM - last menstruation

**POSSIBLE PATHOLOGIES DURING THE PREGNANCY:** slowing down of the fetal development (with a subsequent diminishment of the newborn's birth weight to less than 2500g); diabetes in the mother associated with an excessive birth weight of the newborn (more than 4500g), gestational hypertension, pre-eclampsia.

**LONG TERM EFFECTS:** this term refers to a series of complications and of invisible effects caused by the in-uterus period which may emerge during the first years of the baby's life or even in the adult life.

### THE DAILY NEED FOR ENERGETIC ELEMENTS

In order to choose the correct dietary plan we must first establish the daily need for energetic elements which must be achieved by means of different nutrients. The daily intake of calories varies based on the pre-pregnancy weight of the mother. This weight is considered in terms of BMI (Body Mass Index), a term which has entered everyday vocabularies and which is calculated as the weight divided by the squared height.

The recommended levels of energy and assumption of nutrients (LARN) are also common words in everyday vocabulary for the Italian population (we see the acronym LARN on cereal boxes, on frozen foods, on cookie packages, etc) and they suggest that the need for energetic elements is increased in underweight women and that it decreases when the BMI is higher.

Definition	Pre-pregnancy BMI kg/m <sup>2</sup>	Total increase of body weight (kg)
UNDERWEIGHT	<18.5	12.5-18
NORMAL WEIGHT	18.5-24.9	11.5-16
OVERWEIGHT	25.0-29.9	7-11.5
OBESE	≥30	5-9

Table 1 - recommended increases of the body weight during the pregnancy in relation to the pre-pregnancy BMI

For multiple pregnancies, a 16-20kg body weight increase is considered adequate.

Once the maximum levels of the body weight increase during pregnancies has been established, we must specify that this increase must be gradual and that it must follow the physiological phases of the pregnancy itself.

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In fact, in the first trimester, the pondered increase is mainly due to the growth of the uterus and to the increase in the blood volume which do not represent more than 1kg of pondered increase.

In the second trimester, there is a body fat and mammary increase. There is also an important increase in the size of the placenta and of the fetus. This represents the main cause of the increase in the body weight in the third trimester.

➤ *Putting on weight in the first months is not useful and will only make going back to the pre-pregnancy condition more difficult.*



For this reason, during the first trimester, increasing the energetic levels is not necessary. The diet must be kept varied and balanced, without sudden increases in quantities due to the common saying that a pregnant woman needs to eat for two!

Underweight women and women with specific nutritional deficiencies represent a clear exception to the above.

Starting from the second trimester, an increase in the mother's tissues and the growth of the fetus cause the need to increase the intake of energetic nutrients because the need for calories increases.



Let's not forget that pregnant women tend to reduce their physical activities and this also causes them to put on weight.

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Based on the above assumptions, we consider the following gradual increase in weight appropriate:

- 1kg in the first trimester
- 0.5kg/week in the following months

These indications are to be considered valid for women with a normal body weight. In the following table, more precise indications of body weight increases are indicated for underweight and overweight mothers.

Basically, for a woman with the correct body weight who keeps her levels of physical activity constant and without radical decreases, obtaining the correct body weight increase is possible with a near-to-zero increase of the energetic nutrients during the first trimester, with a 340 Kcal/day increase in the second trimester and with a 450 Kcal/day increase in the third trimester (when the growth and the weight increase in the fetus occur).

	Pre-pregnancy BMI <18.5kg/m <sup>2</sup>	Pre-pregnancy BMI 18.5- 25kg/m <sup>2</sup>	Pre-pregnancy BMI >25kg/m <sup>2</sup>
Supplementary need/day (Kcal)	365	300	200
Supplementary need/day with reduced physical activity (Kcal)	365	150	100

Table 2 - energetic need during the pregnancy

Keeping these considerations in mind, the daily need for calories and energetic nutrients for a pregnant woman ranges from 1600 to 2400 Kcal/day.

In any case, even in cases of extreme obesity, a strictly low-calorie diet must not be considered and it is highly recommended to never

go below 1500 Kcal/day, keeping the intake of carbohydrates and proteins optimal.

### **VARIED AND BALANCED DIETS**

It is important to follow a varied and balanced diet in order to obtain an adequate intake of important nutritional elements for the fetus. This guarantees a correct development and growth of the fetus without deficiencies of one nutrient or the other which may be damaging for the newborn or for the mother.

We will briefly analyze these nutrients, vitamins and minerals and we will focus on the correct amounts to be absorbed of these elements, on the foods where they may be found and on how to take them. This booklet does not intend to be considered as a medical-scientific paper. It must be considered as a practical guide which may be useful for all you soon-to-be mothers. You can have a look at this booklet when you have any kind of doubt with regards to your nutrition.

### **MACRONUTRIENTS**

#### *Carbohydrates and fibers*



Carbohydrates are commonly known as sugars (simple and complex) and are the main source of energy for the organism. They should be the main source of energy during pregnancies as well. Their daily calorie intake should be around 55-60% and this intake should occur through foods which have

low glycemic levels such as pasta, legumes, rice, barley, etc. The intake of sugars deriving from sweets, sodas and similar foods

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should be limited because it can lead to unbalances such as pregnancy-related diabetes. We should also consider the “non-available” part of carbohydrates too, and by that we intend fibers. Their daily intake should be of about 30gr which correspond to 4-5 portions. It is better if these fibers are soluble. Fibers favor intestinal transits by contributing to the formation of masses (a common problem during pregnancies is a compression of the intestinal tract which slows down the transit and causes stipsis). Moreover, foods rich in fibers such as bran cereal, are rich in minerals and important vitamins for the organism.

### *Fats*

Fats should represent 25-30% of the daily energetic intake and, of these, only 10% should be represented by saturated fats (the daily need of cholesterol is of 300mg). An intake of fat acids during the pregnancy is also important because these elements are not produced by the organism and necessarily need to be introduced by means of food.



Among these, omega 3 polyunsaturated fatty acids, omega 6 and monounsaturated fatty acids (which can be found in fish) must cover the remaining 20%. An ideal source of polyunsaturated fat acids is extra-virgin olive oil which is also an ideal source for anti-oxidative substances such as vitamin E.



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### Proteins



The need for proteins during pregnancies increases gradually. The guidelines which regulate the daily needs of the organism recommend an average increase of about 6gr/day which corresponds to a daily need of 1,2gr/day.

The important thing is that a significant part of the proteins introduced into the organism is represented by “noble” proteins, with elevated biological levels, such as animal proteins deriving from milk, eggs and meat.

### DISTRIBUTION OF ENERGY LEVEL OF THE 3 MACRONUTRIENTS

Fats: 25-30%

(monounsaturated and polyunsaturated fats = 20% of which 7% of w-6: w-3=5:1)

Proteins: 10-15% (0.98g/kg of boy weight)



Carbohydrates: 55-60%  
(simple sugars=10%)

### FOCUS ON MICRONUTRIENTS: VITAMINS AND MINERALS

The role of micronutrients during pregnancies is scientifically proven: an adequate intake of these elements favors the prevention of malformations of the fetus, reduces the risk of pre-term births and low body weight at birth and favors the correct development of the nervous system of the fetus and protects the health of the mother.

Micronutrients are involved in the structure, the growth, the development and the functioning of the metabolism and of the immune system of the human organism.



Recent surveys and studies in Europe have sadly shown a deficit in the intake of vitamins and minerals in most women both during the pre-conception period and during pregnancies.

The following table shows the levels of micronutrients a pregnant woman should be taking every day. We must stress the fact that, if a woman follows a varied diet and regularly eats fruits, vegetables and milk, all the needs for vitamins (exception made for folic acid which we will talk about further on) are met. If it is not possible to follow a varied diet, a supplement of these elements is absolutely fundamental. The same concept applies to minerals: with the exception of calcium, iron and iodine, the daily need for these substances is met by means of a varied diet.

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ESSENTIAL FATTY ACIDS	Omega 6: 5*
	Omega 3: 1
CALCIUM	1200mg
PHOSPHORUS	1200mg
POTASSIUM	3100mg
IRON	30*mg
ZINC	7mg
COPPER	1,2mg
SELENIUM	55mcg
IODINE	175mcg
THIAMINE - VITAMIN B1	1mg
RIBOFLAVIN - VITAMIN B2	1,6mg
NIACIN (N.E.) - VITAMIN B3	14mg
VITAMIN B6	1,3mg
VITAMIN B12	2,2mcg
VITAMIN C	70mcg
FOLATES	400*mcg
VITAMIN A (R.E.)	700**mcg
VITAMIN D	10*mcg

Table 3 - daily levels of micronutrient intake for pregnant women (Source: LARN 1996)

N.E. = niacin equivalent

R.E. = retinol equivalent

\* In order to fulfill the daily need for these micronutrients, it is sometimes useful to complete their intake with food supplements or with fortified foods. The need for omega 6 fatty acids increases after the tenth week of the pregnancy.

\*\* Too much isn't always better than too little: the teratogenic side effects of excessive doses is are known. Therefore, supplements should only be taken under a physician's advice.

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### *Vitamins*

**Group B vitamins** are numerous and each one has a specific function in the organism. These specific functions are connected to the correct metabolism of carbohydrates, proteins, fats and to the correct functioning of the nervous system. These vitamins are soluble in water, therefore washing the foods too much or cooking them may cause a significant loss.

**Main sources:** animal and vegetable foods, cereals and bran derivatives, wheat.

Vitamin	Main food sources
Thiamine (vit. B1)	Cereals, beer yeast, wheat, soy, pork meat, nuts, beans, peas, eggs
Riboflavin (vit. B2)	Cereals, legumes, pork meat, brewer's yeast
Niacin (vit. PP or vit. B3)	Meat and fish, legumes and bran cereals
Pantothenic acid (vit. B5)	Animal and vegetable based foods, egg yolk, meat and legumes
Pyridoxine (vit. B6)	Meat, fish, legumes and nuts
Biotin (vit. H)	Brewer's yeast, bran cereals, eggs, milk, fruit, vegetables
Folates and Folic Acid (vit. B9)	Dark green vegetables (spinach, beets, broccoli), legumes and nuts
Cobalamin (vit. B12)	Meat, fish, milk, eggs

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**Folic acid (vitamin B9)** is very important for the prevention of spina bifida conditions and for the prevention of anencephaly (defects in the development of the fetal neural tube).

The increase in the intake of this element during pregnancies must be of at least 400mcg/day.

The integration of folates should begin at least three months before the conception if it is “programmed”. Folic acid is a soluble vitamin, therefore foods lose it when they are cooked, conserved or washed too much.

➤ *We recommend eating fresh vegetables. Wash them but do not let them soak for hours (soaking vegetables does not mean making them cleaner!) and try to favor steam cooking.*

Aside from folic acid, the other group B vitamins like B2 (riboflavin), B6 (pyridoxine) and B12 (cobalamin) contribute to the formation of the neurotransmitters of the nervous system and are a part of the so-called homocysteine cycle.



This substance can cause fetal malformations and defects in the placenta if it is present in excessive quantities. This is why we recommend an adequate intake of all the group B vitamins.

The **main sources** of these vitamins are indicated in the table on page 12.

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- *Pay attention to vegan diets because vitamin B12 can only be found in animal foods*
- *We also would like to remind you that, since these vitamins are all soluble in water, the longer they are cooked, the more they will dissolve.*

**Vitamin C** strengthens the natural immune system and protects the organism from infections. A less known characteristic of this vitamin is that it favors the absorption of non-heme iron (the iron which is contained in vegetables).



Vitamin C is a “delicate” vitamin which is easily deteriorated with heat and exposition to air.

**Main sources:** fresh foods such as fruit and vegetables (especially kiwis, citrus fruits, strawberries, peppers, broccoli, spinach and cicory).

- *It is best to eat season vegetables fresh or steam cooked.*



**Vitamin A** (retinol and carotenoids) are fundamental for a correct embryonic development and for the growth of the fetus. It is also fundamental for its sight, reproduction and for the integrity of its immune system.

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It is a liposoluble vitamin: its absorption takes place through fats.

**Main sources:** in nature, retinol may only be found in animal products such as dairy products, eggs and in certain types of fish. Carotenoids may be found in animal products such as milk, butter and cheese and in vegetables, fruit, oranges, and in red and yellow vegetables (tomatoes, carrots, apricots, melons, cassis).

**Vitamin D** is fundamental for the absorption of calcium and it is involved in the metabolism of calcium and of phosphorus: it is therefore fundamental for the development of the bone structure.



**Main sources:** it can be found, although in small quantities, in fish oils, sea-bass, salmon, egg yolk and butter.

➤ *Vitamin D is produced by our exposure to the sun!*



**Vitamin E** (tocopherol) is a liposoluble vitamin with an anti-oxidative function and it can be found in vegetables.

**Main sources:** vegetable oils, dried fruit, spinach, broccoli, cereals. Vitamin E is lost during the cooking process (boiling, frying, and baking).

**Vitamin K** is involved in the correct coagulation of blood and in the bone structure metabolism.



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**Main sources:** green leaf vegetables, such as cabbage, turnip tops, spinach and in liver. Smaller quantities may be found in bran cereals, meat, dairy products and fruit.



➤ *Fruits are rich in vitamins. You should eat at least 5 portions of it per day!*

### *Minerals and oligo-minerals*

As mentioned earlier, the daily need for minerals is covered by a varied and balanced diet, but this need increases during pregnancies.

**Calcium** is involved in the development and preservation of the bones and teeth of both the fetus (their formation starts between the eighth and the tenth week of the pregnancy) and the mother.



**Main sources:** milk and dairy products. Smaller quantities may be found in dried fruits, certain vegetables (like cicory), turnip tops, cabbage and legumes. We must specify that the possibility to absorb the calcium contained in vegetables is lower than the absorption of animal-based calcium.

➤ *Pay attention to vegetarian diets!*

**Iron** is a component of hemoglobin (the carrier of oxygen in the organism) and it contributes to the energetic metabolism. It is therefore necessary for the increase of blood in the mother's body,



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for the development of the placenta and for the growth of the fetus. A lack of iron may cause anemia in the mother, a diminishment of the iron buildups in the fetus-newborn and a decreased growth of the fetus along with a premature birth. Certain dietary elements, such as phytates and polyphenols (contained in coffee and chocolate) inhibit the absorption of non-eme iron while others, such as vitamin C, meat and fish enhance it.

➤ Use lemons as a dressing!



**Main sources:** meat contains eme-iron which is more bio-available. Legumes, green leaf vegetables, bran cereals and dried fruit contain non-eme iron.

**Fluoride** prevents the formation of cavities.

**Main sources:** the main source of fluoride is water. It can also be found in fish. Its lack is rare.

**Phosphorus** is one of the components of the bone structure and of the cells and it is involved in the buildup of energy.

**Main sources:** foods rich in proteins, mainly cereal seeds (wheat), legumes, eggs, meat, milk, bran cereals. The bio-availability of phosphorus is higher in animal foods.



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**Manganese** is involved in anti-oxidative processes as a co-factor.

**Main sources:** bran cereals, fresh fruit, celery, red beets and blueberries.

**Potassium** allows for the nervous transmission to take place. It also allows for the muscular contraction and for the regulation of the hydric balance of the organism to take place.

**Main sources:** fresh foods which have not undergone conservation processes such as fruit, vegetables and meat.

**Sodium** is important for nervous transmissions and for the hydric balance of the organism. An excess of sodium may be dangerous because it can cause an increase in the blood pressure, hydric retention, bloating and loss of bone mass.

**Main sources:** It is highly present in cheese, cereals and vegetables. Its intake also occurs by means of the normal preparation of food.

- Pay attention to excesses and to “hidden” sources of salt.  
Always read the labels on the food you purchase!

**Magnesium** is important for a correct functioning of the cells of the nervous and muscular tissue.

**Main sources:** it is present in almost all foods. It is mainly present in legumes, cereals, dried fruit, green leaf vegetables and bananas.



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**Copper** is good for the skin, the hair, the nails.

**Main sources:** meat, bran cereals, green leaf vegetables, nuts and legumes.

**Selenium** mainly has an anti-oxidative function and a lack in this element seems to be the cause for pre-eclampsia.

**Main sources:** brewer's yeast, meat, fish, bran cereals, legumes, garlic and mushrooms.



**Zinc** is involved in the proliferation of cells, in the production of proteins and in the anti-oxidative activity. A lack in zinc during the first trimester of the pregnancy seems to be linked to fetal malformations and to low weight at birth.

An increased intake of this element, on the contrary, has proven to be helpful in diminishing the risk of premature births and in increasing the birth weight of the newborn.

**Main sources:** meat, fish, cheese, legumes, and nuts. It is also present, although in smaller quantities, in bran cereals.

*In general, the anti-oxidants which derive from our diet (more specifically vitamins C and E, selenium, zinc, copper, beta-carotene) improve many functions of the immune system and decrease the pathological consequences deriving from inflammations and oxidative stress. Therefore, we can theorize on their role in the reduction of inflammatory responses in the placenta, in the improvement of the oxidative stress parameters and in the prevention of pre-eclampsia\*.*

\*clinical syndrome which occurs during the second half of the pregnancy and which is characterized by an increase in the blood pressure in the arteries (hypertension), by a loss of proteins through the urine and by a swelling of the lower limbs.

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**Iodine** is a component of the thyroidal hormones and it is therefore involved in the correct morpho-genesis of the internal organs and systems. It is also involved in the correct functioning of the thermogenesis and in the metabolism of carbohydrates, proteins and fats. A lack in iodine may cause low thyroidism, cretinism and undersized newborns.

**Main sources:** iodine can be found in most kinds of food, especially in fish, crustaceans and seaweed. Smaller quantities may be found in meat and eggs.

**Omega 3** fatty acids deserve to be mentioned on their own. These elements are defined “essential” because the organism is not able to produce them.



They have been considered very important for some time now, especially because they favor the development of the brain and of the retinas and because they reduce the risk of premature births.

**Main sources:** omega 3 can be found in most kinds of fish (especially in blue-fish), in some vegetables such as almonds, nuts, tofu (soy-based cheese) and sesame.

The ideal intake of omega 3 is equal to 2 portions of sea-fish (which is rich in polyunsaturated fats) per week. The ideal kinds of fish to be considered are salmon, sardines and sea-bass.

### ADVICE ON HOW TO USE FOOD IN THE BEST POSSIBLE WAY

#### Fruit and vegetables

- It's better if they are fresh
- Frozen food is better than canned food
- Wash them well with cold water and baking soda (or with a couple of drops of a specific detergent) and rinse well. Do not let fruit and vegetables soak in water for long periods of time: they will lose their hydro-soluble vitamins and will not be cleaner anyway
- Try to steam cook rather than boil the vegetables so you lose less vitamins

#### Meat and fish

- Always touch your food with clean hands
- Avoid raw fish and meat especially if your toxoplasmosis test was negative. In this case, you should also avoid raw lunch-meat, especially the kind that derives from pork such as salami
- Try to choose simple cooking methods such as steam cooking

#### Dressings

- Raw extra-virgin olive oil is the best option
- Keep the oil in a dark and cool place because the vitamin E contained in it is sensitive to oxidation. Do not re-use cooked oil.

### ADVICE FOR SOON-TO-BE MOTHERS

#### DOs

- Follow a varied and balanced diet and always include mixed food groups in your everyday meals: cereals, fruit, fresh vegetables, animal proteins (fish, lean meat, eggs: these are sources of proteins with an elevated biological value, group B vitamins, bio-available iron, zinc, copper, etc), vegetable proteins (legumes: these are a source of proteins, fibers, magnesium and iron), milk and dairy products (these are sources of bio-available calcium)
- Try to include fish in your diet instead of meat. Fish is a source of omega 3 fatty acids (sardines, sea-bass, salmon, etc.)
- Enrich your diet with milk and dairy products (yoghurt, lean cheese, ricotta)
- Eat small but frequent meals
- Eat at least 5 portions of fresh fruit and vegetables per day: these are sources of vitamin C, carotenoids, folic acid, minerals (potassium, selenium, etc.), anti-oxidants, water and fibers
- Eat carbohydrates daily because they constitute the main source of energy (60%). Try to focus on complex carbohydrates (starch, fibers and thiamine): cereals (bread, pasta, rice, corn, farro, barley, couscous, etc.), pseudo-cereals (saracen wheat, quinoa, etc.) and legumes. These allow you to keep your glycemia under control and favor the prevention of stipsis (a common disturb during pregnancies)
- Drink lots of water
- Choose simple cooking methods
- Use raw fats and do not re-use cooked fats
- Always read the packaging labels

### DON'Ts

- Don't put on too much weight
- Don't drink cold, sweet or bubbly beverages (sodas)
- Don't use too much salt or sugar
- Don't eat too many sweets, fried foods, sauces, canned foods and elaborated foods
- Don't adopt "do it yourself" diets, unbalanced diets, low calorie diets, strictly vegetarian diets (the calcium and iron contained in vegetables are not fully absorbed by our organism. Vitamin B12 is not present in vegetables)
- Don't drink strong alcoholic beverages (whiskey, vodka, etc.): alcohol is a teratogenic agent and it can cause the fetal alcoholic syndrome. It also interferes with the absorption of folic acid and vitamin B12
- Don't drink too much wine (maximum 1-2 glasses per week and always during meals)
- Don't consume too many beverages with nerve agents (coffee, tea, chocolate, cola-based beverages, etc.)
- Don't do drugs
- Don't smoke. At least do not smoke more than 6 cigarettes per day (this includes ultra light cigarettes)
- Don't use too many fat dressings (butter, lard, cream)
- Don't drink or eat non-pasteurized dairy products, raw or rare sea-food, meat or fruit and vegetables.

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