

## Gluten-free cereal-based products: nutrition facts

I chose this title for my talk because I would like to show you something new and interesting about gluten-free products, in particular about their raw materials. In recent years eating and baking gluten-free foods has never been easier. There is greater nutritional, organoleptic and technological quality, variety (in fact many types of bread or cakes or others snack exist) and a greater number of manufacturers. For example, there are about 13,000 products on the Italian market alone. We know that the scientific knowledge of gluten-free food is in a continuing state of development. Recent news concerns: the new definition of "gluten-free products", i.e. products containing less than 20 parts for millions; and "low gluten products" i.e. products containing above 20 and up to 100 parts for millions. Moreover the recent news concerns the possibility to use both the pure oats and wheat gluten-free starch as raw materials for gluten-free products. In my opinion it is possible to do more and better.

I will divide my presentation into three parts. First of all, we will briefly look at the **celiac condition**. During the Symposium we improved our knowledge about this issue

so now I would like to focus on the nutritional assessment of celiac people. Then we will examine the **quality of the gluten-free products**. At the end of my talk we will have a much better idea of the **world of cereals**, in order to:

- improve the health of celiac individuals
- improve the nutritional quality of gluten-free manufacturers.

## **Celiac condition**

The gluten-free diet currently remains the cornerstone treatment for celiac disease. A lot of studies demonstrate that there are some nutrient deficiencies, at the time of diagnosis, due to the length of time that person has lived with the active, but undiagnosed disease, and the extent of damage to the gut intestinal tract and the degree of malabsorption. Some of these deficiencies disappear with strict dietary control. If such strict dietary control is followed long-term then the only remaining deficiencies in celiac individuals will be dietary fibre, folic acid and vitamin B<sub>12</sub>.

Usually this situation is due to the incorrect use of FOOD and incorrect lifestyle.



## **Quality of gluten-free products**

As for the quality of gluten-free cereal-based products we will focus our attention on their nutritional quality.

The scientific community has recently agreed to disregard gluten-free products because they are considered to contain high levels of lipids, sugars and salt, whereas they are considered a poor source of dietary fibre and phyto-compounds such as minerals, vitamins.....

This condition plays an important role in the development of chronic-degenerative diseases, i.e. cardiovascular diseases, hypertension, type II diabetes, cancer, obesity, tooth caries, high levels of cholesterol and triglycerides.

Further comments are necessary. The first one concerns food intake. In fact, celiac persons consume small amounts of freshly produced biscuits, bread and pasta, whereas they eat a lot of products made by gluten-free food companies.

On the other hand, the food manufacturers use these ingredients because they possess interesting technological properties to improve the flavour of the food, the shelf life of the products, the texture of bread or snacks.



In actual fact only those cereals which are circled in red are “cereal killers” (it is a nice word play!) because they contain gluten.

As for oats there is a new development. Recent evidence suggests that pure oats can be tolerated by individuals with CD.

We know that cereals provide our bodies with good amounts of carbohydrates, proteins and low levels of lipids. These macronutrients have been widely investigated in recent years so I would like to show you something new.

I will discuss biologically active components such as inorganic compounds, vitamins, dietary fibre and other compounds that possess antioxidant activities, such as phenols, phenolic acids, pigments and so on.

### **What phyto-chemicals are?**

They are defined in this way because they are chemicals produced by plants to protect themselves.

Recently a lot of studies have demonstrated that they can protect humans against damage caused by free radicals.

**Why do we want to talk about them?** Because, in recent years, cereals and their components are accepted as functional foods and nutraceuticals because of providing nutrient with antioxidant activity required for human health. Moreover, in my opinion, there is a strict correlation between these components and the common nutrient deficiencies both in celiac person and gluten-free products.

Now I would like to show you some examples of important phyto-compounds and I would like to investigate some gluten-free cereals with a good levels of them.

## **Minerals**

These play a lot of important biochemical, structural and nutritional roles. They are constituents of body tissues and fluids and work in conjunction with enzymes, hormones, vitamins.

Here I show you the minerals pattern in the two typical cereals of the gluten-free diet, i.e. corn and rice. We can see the most common mineral in cereals such as Calcium, Iron, Copper..... If we consider pseudo-cereals and minor cereals such as amaranth grain and teff we are able to improve both variety and nutritional quality.



Another important phyto-component is **dietary fibre**.

The American Association of Cereals Chemists defined the dietary fibre as the edible part of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine. Complete or partial fermentation occurs in the large intestine by microflora (i.e. microorganisms that normally live in the digestive tract and can perform a number of useful functions).

In the table I have summarized the components of dietary fibre.

Dietary fibre promotes a great number of health benefits..... see slide

The most natural sources of dietary fibre are vegetables, fresh fruit (including peel or skin). However, the amount and composition varies depending on the ripeness of the fruit and vegetables, type, cultivation environment etc.....

Also nuts, pulses and wholemeal cereals such as corn and rice are a good source of dietary fibre. It is possible to improve the nutritional quality of gluten-free products including pseudo-cereals such as ..... and minor cereals such as teff. Here you can see the good level of dietary fibre both in buckwheat and teff.



**Other health-promoting** components with a strong antioxidant activity are phenolic compounds and here I show you an overview of them.

From a chemical point of view the general definition of phenolic compound is any compound which contains a benzene ring with one or more hydroxyl groups. Research has shown that phenolic compounds are able to reduce risk of cardiovascular disease, ischemic stroke, type II diabetes, metabolic syndrome and gastrointestinal cancers. All plant-based foods contain phenols, which affect their appearance, taste, aroma and oxidative stability.

Many phenolic compounds in fruit and vegetables are also reported in cereals. Now I will discuss some of them.

**Carotenoids** are coloured pigments and they are believed to provide antioxidant protection to lipid-rich tissue. Recent interest in carotenoids has been stimulated by epidemiological studies which suggest that they are able to reduce the incidence of several chronic degenerative diseases. Moreover they have anti-allergic, anti-inflammatory and gastroprotective properties.

After speaking about dietary fibre and carotenoids we can see that one important good source of them is rice.

Here I show you the levels of anthocyanins (i.e. water-soluble pigments that contribute the blue, purple and red pigmentation in plant foods). In the table I reported the amounts of anthocyanins in corn and rice.

Phenolic acids include gallic, vanillic, syringic, coumaric, caffein and ferulic are important components with a protective role against the cell-damaging effects of free radicals and they lower the risk of chronic degenerative diseases and the risk of other age-related diseases.

In the table I showed you the levels of phenolic acids in some gluten-free cereals such as.....

**In conclusion**, I hope that I have given you an overview of cereals to improve the variety of the raw materials of gluten-free products. In particular, I hope to have demonstrated that if we improve our knowledge about chemical composition of cereals, we will be able to produce healthy and well-balanced gluten-free products.

What does well-balanced mean?

It means making a gluten-free product with small amounts of lipids, sugars and salt and good levels of dietary fibre and phyto-components.