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SEKCJA 18. TECHNIKA.(ТЕХНИЧЕСКИЕ НАУКИ)

Subsection 4. Innovative technologies.

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WHAT IS GLUTEN AND HOW IT IS HARMFUL

The article is devoted to the study of genetic disease control – particularly celiac disease. The disease is characterized by protein intolerance of cereals – gluten. For preventive and therapeutic nutrition the use of food products made with gluten-free germinated cereals is proposed.

Keywords: protein, gluten, celiac disease, disease, food products, gluten-free, germination, grain.

At this time the production of food products, that reduce various diseases, including genetic, is very promising and progressive. The most frequent genetic disease is celiac disease. Patients with celiac disease need strictly keep to gluten-free diet. For patients with celiac disease gluten proteins of wheat, barley and rye are toxic. Proteins of corn, rice, buckwheat, sorghum, lupine and amaranth aren't toxic. Concerning grain of oats, we must mention that in different countries recommendations for its use are different. For example, in Finland, Sweden, Norway, England oats are recommended to use by patients with celiac disease. In the USA this issue is still discussed and in most European countries use of oats for patients with celiac disease is not recommended.

Scientists of Italy and Australia determined that the reaction to oats depends on the type of oats. Clinical studies have shown that oats can improve the nutritional value of the diet and overall quality of life. But it's not recommended to use it widely just because its grain can be contaminated with other cereal crops and therefore the "purity" of oats in its growing, storing and grinding cannot be guaranteed. A few grains of wheat or barley in one kilogram of oats can give a negative reaction. However, products with "pure" oats are in demand as dietetic food for people with celiac disease.

Gluten – is a special cut of vegetable protein. It makes a lot of products delicious: it adds some softness and friability to the bread, adds some ductility to the pastry, it makes soup and sauce thick and rich. But it is forbidden for people who suffer from such special illness as celiac disease to eat products which contain gluten.

Celiac disease is an illness closely related to gluten intolerance, which is grain crop protein. It influences destruction of small intestine villi, which are responsible for food absorption, and it leads to disorder of foodstuffs uptake.

Nowadays humanity more and more often experience congenital disease, which is connected with crop protein – gluten intolerance.

Genesis of celiac disease is caused by human organism intolerance of one of protein components – prolamine.

Protein contains 4 cuts: albumin – water-soluble proteins, globulin – nonsoluble in clean water, but soluble in weak saline, prolamine – group of water-nonsoluble proteins, but soluble in 60-80% ethyl alcohol, and glutelin that is soluble in weak alkaline solution.

Two last cuts are called "gluten". Different names of prolamine are used in differ-

ent cereals: wheat – gliadine, rye – secaline, barley – hordein, oats – avenine, maize – zein, rice – orizenine [1]. The highest concentration level of prolamine is in wheat, barley and rye. Products that do not contain gluten are considered to be safe for people who suffer from celiac disease.

In the past celiac disease was considered to be a rather rare illness – one case per 10 000 humans. Yet as number of research grew, it was discovered that this disease occurred more often. In recent years spread of this disease considerably increased.

Celiac disease spread in Western Europe, the USA and Canada makes 1:300. Across CIS celiac disease is considered to be rare (1:3000 – 1: 5000). 80% among sick people are women. A real number of sick people is considerably higher due to a plenty of unrecorded cases.

This illness was diagnosed among children more frequently, but now it is known that 60% of new sick are adults. Also it is clear that if a family member suffers from celiac disease, the risk of sick child birth is 10%. There is higher risk in families, which have sick on pancreatic diabetes [2].

Clinical presentation of celiac disease is very diverse. Children suffer from insufficient increase of body weight, nausea, meteorism, abdominal distension, diarrhea, diathesis, increased nervousness. Adults suffer from diarrhea, meteorism, body weight lose and asiderotic anemia.

There are no medicals for curing celiac disease results nowadays. The main treatment method is a strict lifelong diet with complete exclusion of all products that contain gluten, notably: bread, bakery, confectionery, noodles, cooked cereal: wheat, rye, barley and oats.

It is forbidden to eat products that contain preservatives (latent gluten) – sauce, yoghurt, bouillon cubes, tinned food, sweets, candy, instant coffee and tea. In many cases, the mucosa of the small intestine is completely renewed after eliminating gluten from the diet of the patient.

The basis of the diet for celiac disease patient includes rice, corn, buckwheat, meat, vegetables , fruits, beans, potato.

As yet in Ukraine there is only Polish and Italian food that can be consumed by celiac disease patients.

In recent years scientists from Altai State Technical University named after I.I. Polzunov started the development of gluten-free pastry for prophylactic and therapeutic feeding [3]. So do the scientists from St. Petersburg branch of the State Research Institute of Baking Industry, LLC " Protein " [4]. Considerable researches in the development of gluten-free confectionery are done under the direction of Ph.D. A.M Dorohovych at the National University of Food Technologies (Kyiv).

Providing celiac disease patients with gluten-free products of domestic production is a serious medical and social problem. The use of food prepared from gluten-free products provides not only treatment for patients with celiac disease but also due to gluten-free diet it helps to maintain appropriate functional level of patient's health [5].

The most effective and worldwide recognized method of solution the problem of nutrition is fortification of the daily ration with the products of high biological value.

It is known that during the germination the grain is enriched with biologically active substances: low molecular weight proteins, sugars, amino acids, vitamins, enzymes and phytohormones.

At the same time the action of hydrolytic enzymes causes the increase of sugar content in 3 – 4 times (glucose, maltose, fructose), the content of free amino acids increases in 2 – 2.5 times, including the increase of free essential amino acids in 3 – 4 times.

The study of the influence of germinated cereal products on the human body, especially on pregnant women and children for many years has been being explored by scientists –medical workers of Institute of Pediatrics, Obstetrics and Gynecology of NAMS of Ukraine in collaboration with experts – technologists of NUFT.

It does not cause a doubt that the use of germinated grains (malt) in the manufacture of medical foods, including food for people with celiac disease, will give an opportunity to increase the effectiveness of their use.

The development of new types of confectionery that are therapeutic for people with celiac disease, and also have a high content of bioactive substances is timely problem in Ukraine.

The Department of Bakery and Confectionary Goods Technology of NUFT has been dealing with this issue successfully for more than a year and has progressed substantially. Such work of this department as the use of new raw material – malt flour of different cereals in the manufacture of confectionery is widely known. The current tendency to reduction of caloric content and increase the physiological value of food requests to improve the formulations and technologies. At this time there is a possibility of increasing production volumes of food products with low content of fat, sugar and instead we get products enriched with vitamins, micro and macronutrients. The promising type of alternative raw material for confectionery is processed malt of cereals – malt flour that contains reducing sugars, low molecular weight proteins, it also has high amylase and proteolytic activity, and a number of redox enzymes.

In order to develop high-quality therapeutic gluten-free products the malt made from gleten-free cereals is needed.

That's why The Basic research laboratory of NUFT started to develop the technology of malt from gluten-free cereals since January of this year.At this time we conduct negotiations with Rice Research Institute at Ukrainian Academy of Agrarian Sciences (UAAS) and with National Scientific Centre "Institute of Agriculture of the National Academy of Agricultural Sciences' on how to obtain high-quality gluten-free grain. Also we are managing to create the research laboratory plant for malting of grain.

It should be pointed out that necessary equipment for making gluten-free malt was developed and installed on existing malting plant by laboratory specialists in past years. The design of the equipment, its installation and taking into use was done with the participation of the authors of this work. This gives the right to hope that making gluten-free malt production batches will be made promptly and efficiently.

The work is carried in close cooperation with the Department of Bakery and Confectionary Goods Technology. Finished gluten-free malt will be used by specialists – confectioners in developing new types of therapeutic products for people with celiac disease.

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