ARE THERE ANY PROGRAMMES LINKING PHYSICAL EDUCATION AND NUTRITION AT THE FACULTY OF CHEMICAL AND FOOD TECHNOLOGY?

ĽUBOMÍR VALÍK[1] – EVA HYBENOVÁ[1] - LUCIA MIKUŠOVÁ[1] - LUCIA BÍROŠOVÁ[1] - MIROSLAV BOBRÍK[2]
[1]Department of Nutrition and Food Assessmen
[2]Department of Physical Education and Sports
Faculty of Chemical and Food Technology, STU Bratislava
Slovakia

ABSTRACT

Despite the chemical and technological character of the Faculty of Chemical and Food Technology (FCHFT, est. in 1939), history of this institution includes important activities of various representatives of Physical education in Slovakia. Perhaps the most famous personalities of the Department of Physical Education at the former Faculty of Chemical Technology were Assoc. Prof. Dr. Jozef Vengloš, (former Czechoslovak football player, coach and manager) and Dr. Mária Mračnová, (the medallist of the European Athletics Championships in 1969 and finalist of two Olympic Games in high jump discipline). At present, both they are the honorary members of the Slovak Olympic Committee at present.

Within the lecture presented at the 8th FIEP European Congress, we would like to provide the information on our present pedagogical and research activities carried out at the Faculty of Chemical and Food Technology that are connected with physical and nutritional education of the students. We also focus on some physiological or nutritional benefits connected with balanced diet and foods with added values, e.g. with probiotic effects.

From the current projects of our department, a four month long intervention study was realized in cooperation with the Department of Physical Education (FCHFT) in cooperation with Slovak Medical University. The research was aimed to test the effectiveness of newly designed dance programme combined with nutritionally balanced diet and functional cereal drink consumption as a tool for civilisation disease prevention. A significant improvement was seen in the monitored anthropometric and biochemical parameters what may play an important role in the process of enhancing the general quality of life, covering not only faculty students but also adult population.

Moreover, our department has participated on the realisation of EU project “Health effects of plant food and the possibility of reduction of health risks” in the cooperation with Slovak Medical University. Differences in qualitative and quantitative composition of gut microbiota of vegetarians and non-vegetarians were studied within the project. Besides publications in scientific journals, the outputs of this cooperation were the conference “Nutrition in the civilisation disease prevention” and a brochure concluding all the project results aimed not only for experts but also for general population,

To the new priorities of our faculty belongs also the connection of the research and education in the field of nutrition with exercise and physical education which should create a base of the high quality and healthy life. Since there are no specialized programmes integrating nutrition, sports and health on the Slovak universities, our aim is to create a new specialisation in the collaboration with the Faculty of Physical Education and Sports (Comenius University in Bratislava) covering the interests of physically active general population, in contrast to highly profiled sports nutrition concentrated more on sports professionals.

Key words: physical education programmes, nutrition, probiotics

INTRODUCTION

Despite the chemical and technological character of the Faculty of Chemical and Food Technology (FCHFT, established in 1939), history of this institution includes important activities of various representatives of Physical education in Slovakia. Perhaps the most famous personalities of the Department of Physical Education at the former Faculty of Chemical Technology were Assoc. Prof. Dr. Jozef Vengloš, (former Czechoslovak football player, coach and manager) and Dr. Mária Mračnová, (the medallist of the European Athletics Championships in 1969 and finalist of two Olympic Games in high jump discipline). At present, both they are the honorary members of the Slovak Olympic Committee at present.

Pedagogical and research activities of Department of Nutrition and Food Assessment are connected with physical and nutritional education of the students. We also focus on some physiological or nutritional benefits connected with balanced diet and foods with added values, e.g. with probiotic effects.

From the current projects of our department, a four month long intervention study was realized in cooperation with the Department of Physical Education and Sports (FCHFT) and in cooperation with Slovak Medical University. The research was aimed to test the effectiveness of newly designed dance programme combined with nutritionally balanced diet and functional cereal drink consumption as a tool for civilisation disease prevention. A significant improvement was seen in the monitored anthropometric and biochemical parameters what may play an important role in the process of enhancing the general quality of life, covering not only faculty students but also adult population.

Moreover, our department has participated on the realisation of EU project “Health effects of plant food and the possibility of reduction of health risks” in the cooperation with Slovak Medical University. Differences in qualitative and quantitative composition of gut microbiota of vegetarians and meat-eaters were studied within the project.

To the new priorities of our faculty belongs also the connection of the research and education in the field of nutrition with exercise and physical education which should create a base of the high quality and healthy life. Since there are no specialized programmes integrating nutrition, sports and health on the Slovak universities, our aim is to create a new specialisation in the collaboration with the Faculty of Physical Education and Sports (Comenius University in Bratislava) covering the interests of physically active general population, in contrast to highly profiled sports nutrition concentrated more on sports professionals.

Education and research at the Department of Physical Education and Sports

Physical education has a major role to play in the development of young people. It is an integral part of the total education of any child and is closely linked to other creative and learning experiences. Through physical education, psychosocial development may be nurtured and opportunities created to develop interpersonal relationships, personal growth and self-esteem. Objectives such as good sportsmanship, cooperation, team work, giving and receiving support, appreciation for regular exercise, emotional control, leadership and fellowship skills and the development of a positive self concept can be furthered.

Regular physical activity provides numerous health benefits - from leaner bodies and lower blood pressure to improved mental health and cognitive functioning.

The Department of Physical Education and Sports at the Faculty of Chemical and Food Technology at the Slovak University of Technology can be divided into three basic areas: pedagogy, scientific research, and others. The management abilities of the lecturers and departments were checked by Slovak Academic Championship in 1988 and 1998, which also organized The University Games in 1989 and

2008 wherein the teachers of the department plyaed key roles. The performance of an enduring positive attitude of our faculty management is because of the fact that our faculty built a physical education complex (2 gymnasiums-the last one made of artificial turf cover in 2009, 1 sauna, 2 fitness centres, a table tennis room and 2 physical education laboratories to diagnose physical ability and bodily performance. Teaching are focused on the traditional sporting activities involving swimming, football, voleyball, basketball and on novel activities such as aerobic, fitball, Pilates exercises, spinning, floorball, tennis, table tennis, weight training, karate, kalanethics, harmonic gymnastics, healing gymnastic, canoeing and kayak, and other attractive and motional physical and health programs. Our students can take part in following sports activities: ski trips, rafting, summer physical education camps (biking and hiking), FCHPT sport days and Santa Claus sport days. Sport able-bodied students and employees represent our faculty in university league, and in STU Championship in basketball, volleyball, football, futsal, swimming, and table tenis.

Research of the department concentrates on solving questions of fitness, bodily performance, physical ability and the physical education of undergraduates as well as on the history of physical education and sports. The members of the department have proven their specialization working as trainers and national trainers in top physical educational bodies in our country and abroad.

An example of the research diagnose of physical activity status of our students is presented on Table 1.

Table 1 Physical activity status of FCHPT students (1)

Gender	BMI (Body Mass Index)		VO_2 max [ml/min/kg]	
	2000	**2011**	**1994**	**2011**
Male	21.85	23.46 ±3.09	43.01	43.89
Female	21.00	20.75 ±2.62	33.12	35.00

The results showed that body height and weight increased with higher living standards. However, weight gain in men does not reflect in higher endurance capabilities. VO_2 max values (also maximal aerobic capacity), which reflects the physical fitness of the individual, reached among men only average values. Among women endurance running and resulting VO_2 max values are below average (1).

Education and research at the Department of of Nutrition and Food Assessment

Pedagogical and research activities of Department of Nutrition and Food Assessment are connected with physical and nutritional education of the students. The interest is focused also on some physiological or nutritional benefits connected with balanced diet and foods with added values, e.g. with probiotic effects.

Ensuring good nutrition – energy

Achieving and sustaining appropriate body weight across the lifespan is vital to maintaining good health and quality of life. Many behavioral, environmental, and genetic factors have been shown to affect a person's body weight. Calorie balance over time is the key to weight management. Poor diet and physical inactivity are the most important factors contributing to overweight and obesity affecting men, women, and children. Overweight and obesity are associated with cardiovascular disease, hypertension, type 2 diabetes, osteoporosis, and some types of cancer.

The total number of calories a person varies depending on a number of factors, including the age, gender, height, weight, and level of physical activity. Estimated total calorie needs for weight maintenance is in range from 1600 to 2400 calories per day for adult women and 2000 to 3000 calories per day for adult men (2).

Carbohydrate, protein, and fat are the main sources of calories in the diet. Most foods and beverages contain combinations of these macronutrients in varying amounts. Balanced diet containing all essential nutrients reduce risk of chronic diseases. Current recommended macronutrient proportion in the diet for adult are:

- Carbohydrates 45-65 %
- Proteins 10-35 %
- Fat 20-35 % (2).

Physical activity guidelines and Nutrition pyramid

The amount of physical activity necessary to successfully maintain a healthy body weight depends on calorie intake and varies considerably among adults, including older adults. For children and adolescents ages 6 years and older, 60 minutes or more of physical activity daily is recommended. All adults should avoid inactivity. Some physical activity is better than none, at least 150 minutes a week of moderate intensity is recommended. Older adults (65 years and older) should be as physically active as their abilities and conditions will allow (2).

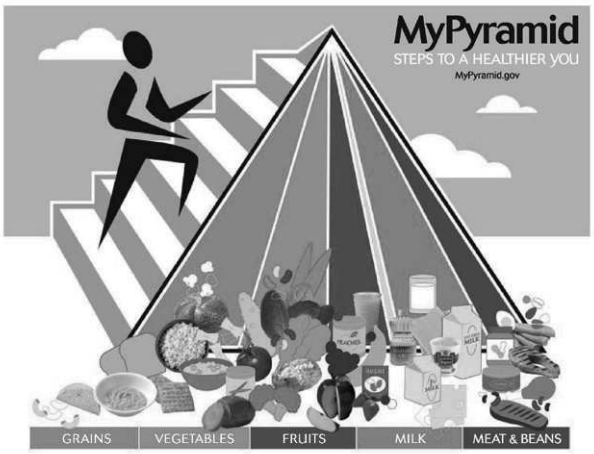

Figure 1
Healthy pyramid www.MyPyramid.gov

The Healthy Eating Pyramid is a simple, trustworthy guide to choosing a healthy diet. A healthy diet is built on a base of regular

physical activity, which keeps calories in balance and weight in check. In 2005 the **U.S Department of Agriculture (USDA)** released a food pyramid called **MyPyramid**, which was designed to educate people about healthy nutrition (Fig. 1). The design of MyPyramid consists of vertical colored stripes. Each color has a different size, suggesting the amount of food that should be chosen from each group. The figure on the stairs represents the importance of physical activity.

Probiotic microorganisms

A great part of the research at the Deparetment of Nutrition and Food Assessment is focused on the properties of health beneficial probiotic bacteria. Probiotics according to the World Health Organization (WHO) are defined as „live microorganisms which, when administered in adequate amounts, confer a health benefit on the host“ (3). Common microorganisms used in probiotic preparations include *Lactobacillus, Bifidobacterium, Lactococcus, Enterococcus, Streptococcus* and *Saccharomyces* (4). Criteria for the selection and assessment of probiotic lactic acid bacteria included: human origin, nonpathogenic behavior, resistance to technologic processes (ie, viability and activity in food or dietary supplements), resistance to gastric acidity and bile toxicity, adhesion to gut epithelial tissue, production of antimicrobial substances, ability to modulate immune responses, and ability to influence metabolic activities (eg, cholesterol assimilation, lactase activity, and vitamin production) (4-6). Numerous studies reported health-promoting properties of lactic acid bacteria in animals and humans. These properties include: enhancing the bioavailability of minerals (calcium, iron, manganese, copper and phosphorus), synthesis of several vitamins (folic acid, riboflavin, nicotinamide, pyridoxine, vitamin B_{12}), prevention and treatments of gastrointestinal disorders (diarrhea, gastrointestinal and urogenital infections), treatments of hypercholesterolaemia, and lactose intolerance, reduction in pro-carcinogenic enzymes, stimulation of the immune system, and treatment of allergic and atopic diseases (3,7,8,9).

Strain viability and maintenance of desirable characteristics during product manufacture and storage is a necessity for probiotics. Little is known about the optimal amount of live probiotic bacteria to be administered. It is often recommended that probiotic concentrations must be greater than or equal to 106 CFU/ml in the small intestine and 108 CFU/g in the colon (3,4). The most recent data, a dose of 5 billion CFU (Colony Forming Units) has been recommended for at least 5 days (5x109 CFU/day) (9). In our research, viable numbers of lactobacilli in acidified milk before the expiry date were > 106 cfu/g (Fig. 2-4) (10). This is an effective dose of viable bacteria, by which beneficial effects of probiotics were confirmed (11).

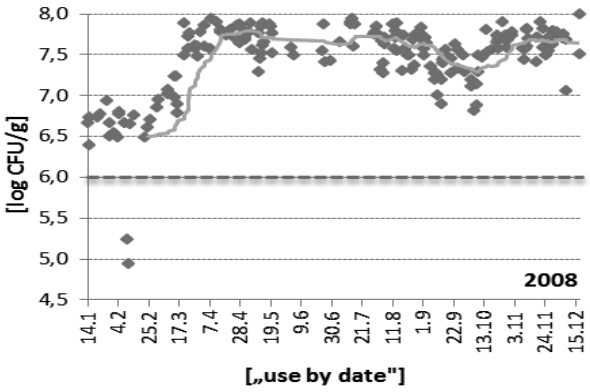

Figure 2
Numbers of *L. acidophilus* in acidified milk “Acidko” at the end of „use by date“ in 2008 (10)

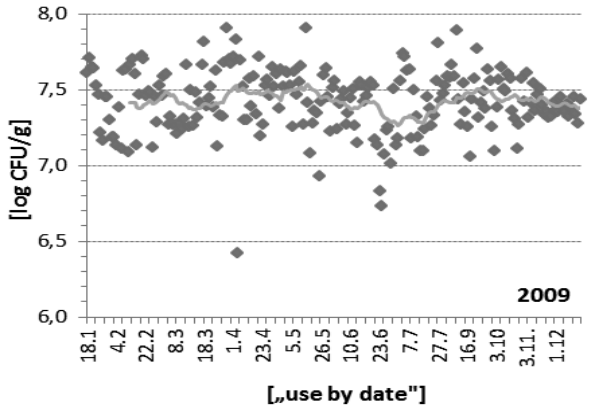

Figure 3
Numbers of *L. acidophilus* in acidified milk “Acidko” at the end of „use by date“ in 2009 (10)

Other research activities of the Department of Nutrition and Food Assessment focus on the areas as follows:

- Nutrition and health research
- Qualitative and quantitative comparison of vegetarian and meat-eaters human microbiome
- Microbiological aspects of food safety and quality
- Food chemistry and analysis

From the current projects of our department, a four month long intervention study was realized in cooperation with the Department of Physical Education and Sports (FCHFT) in cooperation with Slovak Medical University. The research was aimed to test the effectiveness of newly designed dance programme combined with nutritionally balanced diet and functional cereal drink (with betaglucan) consumption as a tool for civilisation disease prevention. A significant improvement was seen in the monitored anthropometric and biochemical parameters (reduced body fat, improved lipid metabolism) what may play an important role in the process of enhancing the general quality of life, covering not only faculty students but also adult population (12).

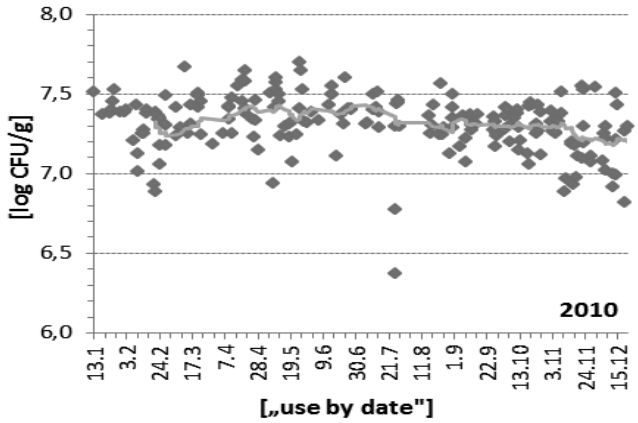

Figure 4
Numbers of *L. acidophilus* in acidified milk "Acidko" at the end of „use by date" in 2010 (10)

The project funded by the Agency of the Ministry of Education, Science, Research and Sport of The Slovak Republic for EU Structural Funds ITMS 26240220022 „Health effects of plant food and the possibility of reduction of health risks" in cooperation with Slovak Medical University was focused on the investigation of intestinal microbiota of Slovak vegetarians and meat-eaters. The most important results demostrated following:

- No significant differences between microbiota of vegetarians and meat-eaters
- *Clostridium* spp. prevailed in microbiota of meat-eaters
- Younger meat-eaters (21-30 years old probands) had higher levels of probiotic bacteria
- Potential mutagens were detected in 20 % of samples in each age group, except meat-eaters aged 31 – 40 where we have observed 5 times lower prevalence (13).

CONCLUSIONS

Healthy nutrition and regular physical activity are essential for normal growth and development and for reducing risk of chronic diseases. The goal of the Department of Nutrition and Food Assessment and Department of Physical Education and Sports at the Faculty of Chemical and Food Technology STU Bratislava is to put scientific knowledge in the education of our students to promoting healthy nutrition and physical activity. Our students of all three degree study programmes (bachelor, engineer and doctorate) participate on research projects and so acquire theoretical and practical knowledge based on the actual state of science.

Since there are no specialized programmes integrating nutrition, sports and health on the Slovak universities, our aim is to create a new specialisation in the collaboration with the Faculty of Physical Education and Sports (Comenius University in Bratislava) covering the interests of physically active general population, in contrast to highly profiled sports nutrition concentrated more on sports professionals.

REFERENCES

Bobrík, M., Koláriková, A., Ondrušová, L., Jaďuďová, K., Križan, M., Pělucha, R.: Somatický profil a motorická výkonnosť študentov FCHPT STU v Bratislava. Telesná výchova a šport, 22, 2012, 4, 18-24.

Dietary Guidelines for Americans, 2010. Available on the web: www.dietaryguidelines.gov

Aureli, P., Capurso, L., castellazzi, A.M. et al.: Probiotics and health: An evidence-based review. Pharm. Res., 63, 2011, 366-376.

Collins, J. K., Thornton, G., Sullivan, G. O.: Selection of probiotic strains for human applications. Int. Dairy J., 8, 1998, 487-490.

Dunne, C., O`Mahony, L., Murphy, L., et al.: In vitro selection criteria for probiotic bacteria of human origin: correlation with in vivo findings. Am. J. Clin. Nutr., 73, 2001, 2, 386S-392S.

Gueimonde, M., Salminen, S.: New methods for selecting and evaluating probiotics. Digest. Liver Dis., 38, 2006, 2, S242-S247.

Guarner, F., Malagelada, J. R.: Gut flora in health and disease: a review. Lancet, 8, 2003, 512-519.

Salminen, S., Ouwehand, A. C., Isolauri, E.: Clinical application of probiotic bacteria. Int. Dairy J., 8, 1998, 563-572.

Iannitti, T., Palmieri. B.: Therapeutical use of probiotic formulations in clinical practice. Clin. Nutr., 29, 2010, 6, 701-725.

Valík, Ľ., Liptáková, D., Medveďová, A.: Obsah probiotických baktérií *L. acidophilus* v kyslomliečnom výrobku na konci doby spotreby. Farm. obzor, 81, 2012, 3-4, 49-53.

Holzapfel, W.H., Schillinger, U.: Introduction to pre- and probiotics. Food Res. Int., 35, 2002, 2-3, 109-116.

Mikušová, L., Penesová, A., Valachovičová, M., Holubková, A., Mikuš, Ľ., Šturdík, E.: Cereal beta-glucan Fibre Drink as a Part of Nutritionally Balanced Diet Alters Lipid Profile: An Intervention Study. Asian J. Plant Sci., 11, 2012, 3, 153-156.

Birošová, L., Olejníková, P., Kaliňáková, B., Kaliňák, M., Hudecová, D., Lakatoš, B., Šimkovič, M.: Pozitíva a negatíva črevnej mikroflóry - môžeme ich ovplyvniť stravou? In: Výživa v prevencii ochorení, Bratislava: Slovenská zdravotnícka univerzita v Bratislave, 2012, 26-32. ISBN 978-80-89352-65-4.