

Македонски Фармацевтски Macedonian билтен Pharmaceutical Bulletin

волумен 62 (додаток) 2016 / volume 62 (supplement) 2016



Македонско фармацевтско друштво, ул. Маршал Тито 13б/8, Скопје, Македонија
Macedonian Pharmaceutical Association, Marshal Tito 13b/8, Skopje Macedonia

It is our great pleasure to present this Supplement Issue on “*Macedonian Pharmaceutical Bulletin*” to the scientific and professional community. This supplement includes the short communications from the *Sixth Congress of Pharmacy in Macedonia with International participation*, as the largest gathering for the pharmacy profession held in the Republic of Macedonia. The main theme of the Congress was “Modern pharmacist - bridging science with practice”.

A broad spectrum of topics within the pharmaceutical sciences and practice carefully selected for this special occasion in order to build up a highly interesting and comprehensive program were covered. The contributions submitted to the Congress included 6 plenary lectures, 84 section lectures, and more than 240 posters. This Congress, followed the excellent international tradition, was attended by close to 1000 domestic and foreign participants. We received 326 short paper submissions from more than 25 countries. These numbers show that our Congress is aiming for the highest scientific standards, and that it can be considered a well-established venue for researchers in the broad fields of Pharmaceutical sciences and practice.

We would like to thank all internationally prominent researchers for their contribution to reinforcing the overall quality of the Congress. They give the state of the art of the recent advances in the field of pharmacy research.

Sincere thanks to the hosts of the Sixth Congress of Pharmacy in Macedonia with International participation, Macedonian Pharmaceutical Association and Faculty of Pharmacy, Ss Cyril and Methodius University in Skopje for their vision and commitments.

We acknowledge the sponsoring companies: the platinum sponsor AD ALKALOID, Skopje, the golden sponsor PLIVA, the silver sponsor EUROFARM and the bronze sponsor SEPTIMA, for the permanent support to our efforts during the organization.

We would also like to thank our members of the Scientific Committee for their volunteer time and dedication to the critical peer review process and in the organization of the program. We also wish to thank all the members of the Organizing Committee, whose work and commitment was invaluable.

On behalf of the Advisory and Scientific Committees, we would like to especially thank the authors, whose work was the essential part of the congress and contributed to a very successful event. Besides the many academic staff and professionals who contributed to the success of the Congress, we are grateful to the students who participated with oral presentations and posters.

The pharmaceutical sciences continue to grow as dynamic scientific interdisciplinary fields. We believe that published short communications will be an excellent source of scientific material in the fast evolving fields in Pharmaceutical sciences and practice.

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The present issue of *Macedonian Pharmaceutical Bulletin* is a special issue of the 6th Congress of Pharmacy in Macedonia with international participation.

This issue of *Macedonian Pharmaceutical Bulletin* contains short papers accepted by the scientific committee for the presentation at the Congress.

The authors are fully responsible for the contents of their short papers.

All reviewers that were involved in the short papers revision process are sincerely acknowledged.

Probiotics and immunological disorders

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Introduction

Probiotics are defined as live microorganisms that have positive health effects on the host. There are many strains of probiotics that can confer health benefits, but the most prominent species are *Lactobacillus* and *Bifidobacterium*. Numerous evidences indicate that selected probiotic strains can provide health benefits to the human host. Up to date, many clinical trials investigated the medical effects of these bacteria, particularly the positive effects to the gastrointestinal (GI) system. Moreover, studies have shown that probiotics exert beneficial effects to the immune system, the urogenital system, in diabetes, oral health etc. (Charalampopoulos and Rastall, 2009).

The immune system, being highly adaptable defense system, functions in preserving the integrity of the organism by eliminating all elements perceived as foreign. Several in vitro and in vivo studies have shown that specific strains of probiotics are able to modulate the functioning of the immune system, stimulate the immune function to protect against infectious diseases and different types of cancer and regulate over expressed immune responses associated with immune inflammatory disorders such as allergy (Gill and Guarner, 2004). In addition, studies presented beneficial effects in atopic diseases, including atopic eczema, allergic rhinitis and asthma.

The purpose of this review was to explore among the reported effects of different probiotic strains to the immune system, specifically in allergy.

Effects of probiotics in asthma and rhinitis

In one of the study with 41 asthmatic children (age

6-12 years) a decrease of the inflammatory cytokine, TNF- α and Th2 cytokine IL-10 and IL-13 was shown. Peripheral blood mononuclear cells (PBMCs) were collected from the patients assigned to the probiotic-treated groups prior to and following the treatment and were then incubated with phytohemagglutinin, *Dermatophagoides pteronyssinus*, supplemented with *Lactobacillus gasseri* for 72h. Production of the cytokines in the culture supernatants was assayed using enzyme-linked immune-sorbent assay (ELISA). The results of the study showed that the patients who took *L. gasseri* capsules for 8 weeks showed significant decrease in the cytokine level compared to the control group (Chen, et al., 2010).

Another study examined the effect of *Lactobacillus casei* in the treatment of asthma and allergic rhinitis. A group of 187 asthmatic children between the age 2 and 5 years were tested for period of 12 months. This study presented that the milk, fermented with *Lactobacillus casei* didn't show significant difference in the health status of asthmatic children compared to the control group. However, consumption of *Lactobacillus casei* fermented milk resulted in improvement in children with allergic rhinitis, i.e the number of rhinitis episodes was lower in the children treated with probiotics compared to the control group (Giovannini et al., 2007).

Effects of probiotics in allergy animal models

Animal studies concerning effects of probiotics in allergy also emerge, presenting a deeper understanding of the effects of probiotics. For example, one study examined the potential of 28 strains of probiotics in prophylaxis of peanut-induced allergy in mouse model. Groups of 8 mice were orally exposed to PBS (control) or peanut extract (PE) plus cholera toxin (CT). Oral exposure was performed on days 0, 1, 2, 10, 17 and 24. After a 6-week pro-

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biotic treatment with each strain and a 4-week oral exposure regimen to PBS or PE with CT, the IgE specific for PE was measured. The results showed that *Lactobacillus plantarum* increases the IgE in the serum, but *Lactobacillus salivarius* decreases the IgE for PE. In addition *Lactobacillus casei* Shirota didn't show any effect to the IgE for PE, but the measured IL-4 and IL-5 levels were lowered by just using these strains. Again, *L. plantarum* increases the IL-4 level but didn't show any effect on IL-5 and *L. salivarius* showed slightly decreased level of the both cytokines (Meijerink et al., 2012).

Another study in mouse model of asthma studied the effect of *Lactobacillus rhamnosus*, using clinical evaluations in vivo, bronchoalveolar lavage fluid analysis, serum IgG analysis, cytokine and lymphocyte proliferation assays. The mice were sensitized by intra peritoneal administration of 10 µg ovalbumin with alum mixture. Treg cells, isolated from the spleen were analyzed for CD4⁺ CD25⁺ Foxp3⁺ expression using flow cytometry. This study presented that *Lactobacillus rhamnosus* treatment led to a significant increase in CD4⁺CD25⁺Foxp3⁺ Treg cells, compared to the percentage in positive control mice, suggesting that *Lactobacillus rhamnosus* induced attenuation of allergic responses in the mouse model of asthma is associated with an increased CD4⁺CD25⁺Foxp3⁺ Treg cell population (Jang et al., 2012).

Conclusion

Many studies are trying to unveil the mechanisms of probiotic involvement and their beneficial effects to the health. Animal studies and clinical trials in different popu-

lations regarding different medical conditions, present effects that are somewhat controversial. In this context, as our literature research resulted, many of the evidences regarding immunological (allergic) diseases present weak or minimal effects.

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