Innovative and practical conditioning beverages for public health and athletic performance: Focus on immunopotentiation by lactic acid bacteria B240

Minchul Lee1* / Kyunghee Kim2

1. Department of Sports Medicine, CHA University, Pocheon, Republic of Korea.
2. Sports Science team, Marketing Department, Dong-a Otsuka, Seoul, Republic of Korea.

INTRODUCTION

Functional beverages are drinks and food typically intended for health benefits, usually as a medicine or performance enhancer. Examples of functional beverages include sports drinks, energy drinks, and electrolyte (ion) water, with ingredients such as amino acids, vitamins, minerals, and additional fruits or vegetables1. These functional beverages have become popular among people who want specific health benefits and improved exercise performance.

Functional beverages improve public health and athletic performance. They contribute to numerous benefits, such as hydration, maintenance of body fluid level, and improved physical condition. Moreover, these functional beverages help maintain optimum physical condition and raise the quality of life. For example, some functional beverages can improve heart health, immunity, and digestion, while others can supplement and boost energy. Utility and functionality have been identified as important factors influencing the choice of beverage.

Herein, we assess the efficacy of novel conditioning beverages containing the lactic acid bacteria B240 for performance improvement and physiological utility. In addition, we address the issues associated with the effects of B240 on improved immunity-related public health and athletic performance.

Novel conditioning beverages containing the lactic acid bacteria B240 to strengthen immunity

Conditioning drinks support the health and wellbeing of people who seek to maintain optimum physical condition in the daily life. Recently, Otsuka nutraceuticals formulated the proprietary Lactobacillus pentosus strain b240 (B240), which was named “BODYMAINTÉ.” This novel conditioning drink is a functional beverage that could provide protection from regular risks and support the health and wellbeing of people who seek to maintain an optimum physical condition.

B240 is a plant-derived lactic acid bacterium, which was discovered in the fermented tea "Miyan," traditionally consumed in northern Thai-
land. Otsuka nutraceuticals have long been contributing to local people’s health through meat and bite teas, including the "Miyan" tea. It plays a role in maintaining optimum physical condition and prepares for risks on a daily basis.

Recently, B240 was shown to reinforce immune function, and the intake of Lactobacillus resulted in an increase in blood T-helper and natural killer (NK) cell counts and enhancement of NK cell activity in the elderly. B240 is an anaerobic, non-speculating, gram-positive bacterium, originally isolated from fermented tea leaves. Oral administration of B240 in mice resulted in increased synthesis of IgA in the mucosal tissue and increased serum IgG level. Intake of B240 increases the secretion of salivary IgA in healthy adult women and in the healthy elderly. Moreover, recent studies have shown B240-mediated IgA enhancement. B240 is combined with other ingredients in novel products to support good physical condition based on the new concept of protective beverages.

Two types of beverages: electrolytes and proteins

In addition to consuming B240 in a basic and easy way, novel conditioning beverages are of two types, those containing electrolytes and those containing proteins. The former is in drinking form and offers an effortless way to consume the protective B240 and balance electrolyte concentrations for optimum physical condition. It is similar to the body fluid to maintain hydration and is low in calories and refreshing.

The other is in jelly form containing B240 with the whey protein, citric acid and amino acids such as BCAA and Arginine, to help maintain physical condition against regular risks. This protein absorbs quickly and tends to incorporate in body tissues, such as muscles, which support the framework of the body. Furthermore, essential amino acids play a role in muscle growth and recovery. Moreover, arginine supports body recovery with various functions. The purpose of these assorted drinks is to hydrate the body and improve athletic performance. The jelly type is widely used by athletes and other people to maintain optimum physical condition and resilience.

Applying conditioning beverages in the daily life and sports

It is necessary to prepare for risks on a daily basis by having a good physical condition. People face many daily risks that could affect physical resilience, such as poor dietary habits, stress, and aging. People who heavily use the body, such as through sports, should firmly ensure maintenance of the body. Thus, maintenance of physical resilience is important for those concerned with living a healthy life.

People regularly participate in strenuous daily activities, such as sports competitions or work presentations. Everyone wants to make the day a success through hard training and tough work. Therefore, physical condition management for productivity is important. About 60% of body fluid contains electrolytes, such as sodium, potassium, and calcium. Therefore, beverages contain water and electrolytes close to the composition of the body fluid to maintain a balance between them in the body.

Athletes and people who exercise actively lose body fluid and electrolytes through sweat and expend energy. Exercising or competing in a sporting event for over one hour eliminates the need to drink something with excess sugar or electrolyte. Excessive salt supplementation during exercise could lead to gastrointestinal problems or cause further impairment of fluid balance and salt-induced cramps.

The general population occasionally has to work hard, which tends to put a burden on the body. Excessive stress and sleep deprivation make it more difficult to manage the physical condition. For such a person, B240 is recommended with electrolytes or proteins for immunopotentiation. It protects the body and maintains the daily physical condition for good productivity.

Table 1. Nutritional facts of the conditioning drink “BODYMAINTÉ” (drink type).

| Nutritional Facts | Per 100 ml |
|-------------------|------------|
| Energy            | 18 kcal    |
| Electrolytes      | (mEq/L)    |
| Protein           | 0 g        |
| Na+               | 21         |
| Fat               | 0 g        |
| K+                | 5          |
| Carbohydrates     | 4.4 g      |
| Ca2+              | 1          |
| Salt equiv        | 0.13 g     |
| Mg2+              | 0.5        |
| Potassium         | 20 mg      |
| Cl-               | 16.5       |
| Calcium           | 2 mg       |
| citrate3-         | 10         |
| Magnesium         | 0.6 mg     |
| lactate-          | 1          |

Table 2. Nutritional facts of the conditioning food “BODYMAINTÉ” (jelly type).

| Nutritional Facts | Per pouch (100 g) |
|-------------------|-------------------|
| Energy            | 90 kcal           |
| Amino acid        | 2,500 mg          |
| Protein           | 10 g              |
| Valine            | 500               |
| Fat               | 0 g               |
| Leucine           | 1,000             |
| Carbohydrates     | 13 g              |
| Isoleucine        | 500               |
| Salt equiv        | 0.11 g            |
| Arginine          | 500               |
| Vitamin B6        | 5 mg              |
| Citric acid       | 1, 250 mg         |
| Vitamin D         | 10 μg             |

CONCLUSION

In this article, we discussed the effects of the lactic acid bacteria B240 on body physiology. This novel conditioning beverage elicits biological utility responsible for improved sports performance as a functional drink and
has potential health-related implications. Furthermore, we speculated that the practical application of B240 on performance is important in public health promotion, as lack of time is a common barrier to exercising regularly. However, the underlying mechanisms of B240 with electrolytes or proteins might differ from those seen in the subjects. Future studies are needed to uncover the usefulness and interventions for conditioning drinks in public health and athletic performance.

ACKNOWLEDGMENTS

This work was supported by the Dong-a Otsuka Co., Ltd. The authors have no conflicts of interest to declare, financial or otherwise.

REFERENCES

1. Orrù S, Imperlini E, Nigro E, Alfieri A, Cevenini A, Polito R, Daniele A, Buono P, Mancini A. Role of Functional Beverages on Sport Performance and Recovery. *Nutrients*. 2018;10:1470.

2. Szabo NJ, Dolan LC, Burdock GA, Shibano T, Sato S, Suzuki H, Uesugi T, Yamahira S, Toba M, Ueno H. Safety evaluation of Lactobacillus pentosus strain b240. *Food Chem Toxicol*. 2011;49:251-8.

3. Gill HS, Rutherford KJ, Cross ML, Gopal PK. Enhancement of immunity in the elderly by dietary supplementation with the probiotic Bifidobacterium lactis HN019. *Am J Clin Nutr*. 2001;74:833-9.

4. Okada S, Daengsubha W, Uchimuyra T, Ohara N, Kozaki M. Flora of lactic acid bacteria in Miang produced in northern Thailand. *J Gen Appl Microbiol*. 1986;32:57-65.

5. Yamahira S, Toba M, Kishi K, Okamatsu H. Stimulation of mucosal immune system by lactic acid bacteria origination in tea. *JJ Lactic Acid Bact*. 2006;17:57-66.

6. Shimizu K, Sato H, Suga Y, Yamahira S, Toba M, Hamuro K, Kakumoto K, Kohda N, Akama T, Kono I, Kuno S. The effects of Lactobacillus pentosus strain b240 and appropriate physical training on salivary secretory IgA levels in elderly adults with low physical fitness: a randomized, double-blind, placebo-controlled trial. *J Clin Biochem Nutr*. 2014;54:61-6.

7. Kotani Y, Shinjai S, Okamatsu H, Toba M, Ogawa K, Yoshida H, Fukaya T, Fujiwara Y, Chaves PH, Kakumoto K, Kohda N. Oral intake of Lactobacillus pentosus strain b240 accelerates salivary immunoglobulin A secretion in the elderly: A randomized, placebo-controlled, double-blind trial. *Immun Ageing*. 2010;7:11.

8. Shinjai S, Toba M, Saito T, Sato I, Tsubouchi M, Taira K, Kakumoto K, Inamatsu S, Yoshida H, Fujiwara Y, Fukaya T, Matsumoto T, Tateda K, Yamaguchi K, Kohda N, Kohno S. Immunoprotective effects of oral intake of heat-killed Lactobacillus pentosus strain b240 in elderly adults: a randomised, double-blind, placebo-controlled trial. *Br J Nutr*. 2013;109:1856-65.

9. Kotani Y, Kunisawa J, Suzuki Y, Sato I, Saito T, Toba M, Kohda N, Kiyono H. Role of Lactobacillus pentosus Strain b240 and the Toll-like receptor 2 axis in Peyer’s patch dendritic cell-mediated immunoglobulin A enhancement. *PLoS One*. 2014;9:e91857.

10. Peacock OJ, Thompson D, Stokes KA. Impact of a carbohydrate-electrolyte drink on digestive behaviour, affect and self-selected intensity during recreational exercise after 24-h fluid restriction. *Appetite*. 2013;60:5-12.

11. Pollock JS, Ryan MJ, Samson WK, Brooks DP. Water and electrolyte homeostasis brings balance to physiology. *Am J Physiol Regul Integr Comp Physiol*. 2014;307:R481-3.

12. West DWD, Abou Sawan S, Mazzulla M, Williamson E, Moore DR. Whey Protein Supplementation Enhances Whole Body Protein Metabolism and Performance Recovery after Resistance Exercise: A Double-Blind Crossover Study. *Nutrients*. 2017;9:735.

13. Moriwaki H, Miya Y, Tajika M, Kato M, Fukushima H, Shiraki M. Branched-chain amino acids as a protein- and energy-source in liver cirrhosis. *Biochem Biophys Res Commun*. 2004;313:405-9.

14. Kim DH, Kim SH, Jeong WS, Lee HY. Effect of BCAA intake during endurance exercises on fatigue substances, muscle damage substances, and energy metabolism substances. *J Exerc Nutrition Biochem*. 2013;17:169-80.

15. Chang CK, Chang Chien KM, Chang JH, Huang MH, Liang YC, Liu TH. Branched-chain amino acids and arginine improve performance in two consecutive days of simulated handball games in male and female athletes: a randomized trial. *PLoS One*. 2015;10:e0121866.

16. Halperin ML, Skorecki KL. Interpretation of the urine electrolytes and osmolality in the regulation of body fluid tonicity. *Am J Nephrol*. 1986;6:241-5.

17. Poortmans JR, Gualano B, Carpenter A. Nitrate supplementation and human exercise performance: too much of a good thing? *Curr Opin Clin Nutr Metab Care*. 2015;18:599-604.