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Editorial

Rice Function for Disease Prevention and Establishment of Medical Rice Association

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When I visited Bangkok in Thailand about five years ago, I saw the label "*medical rice*" on a package of 'diabetes and health promotion' rice, and I was hopeful that the concept could be widened beyond Thailand. On December 10-12, 2014, the "*East Asia Functional Standardization of Rice Conference*" was held at Kyoto Research Park to promote the idea among related countries.

Since then, I am considering what is "*medical rice*".[1] To say 'medical rice' we need evidence from human studies. We have learned of the health effects of unpolished brown rice, *genmai* in Japanese, from Japanese history. Sagen Ishizuka (1850-1909) was a pioneer doctor in the Imperial Japanese Army who proposed the concepts of *shokuiku* (eating education) and the macrobiotic diet. He was one of the first to investigate the nutritional value of whole grains as well as kelp, radish, and *kudzu*.[2] In Kenji Miyazawa's famous poem "*Unbeaten by rain, Unbeaten by wind*", his daily intake "*With a handful brown rice a day, miso and a small amount of vegetable suffice*" was confirmed to contain all necessary daily nutrients by our recalculation.[3]

We thought that it was necessary to clarify the actual health effects of brown rice diet by a well-designed epidemiological study, so we started GENKI study (*Genmai* Evidence of Nutrition for *Kenko* (health) Innovation).[4,5] There are 1,223 participants from groups promoting a brown rice diet. Brown rice eaters show lower body mass index (BMI) in men and women at all ages. The average BMI in males was 22.0±3.2 kg/m^2 and 20.7±2.8 kg/m^2 in females. Dietary habits consisting of brown rice, rich in vegetables, and avoidance of meat seemed to support healthy life and quality of life (QOL).[4] Obese people were more likely to eat white rice and had a high risk of lifestyle-related diseases, such as diabetes and hypertension. On the contrary, brown rice eaters were less obese and had a good lifestyle with a low risk of illness. In addition, brown rice eaters showed healthy bowel movements, which suggested a good intestinal environment.[6]

Actually, brown rice eaters showed abundance of *Fermicutes* and low relative abundance of *Fusobacterium* in the intestinal microbiota at the phylum level. Abundance of microbiota at species level showed a rich *Faecalibacterium prausnitzii* (5.28%), and then *Blautia wexlerae* (3.67%), *Fusicatenibacter saccharivorans* (3.41%), *Megamonas funiformis* (3.35%), *Collinsella aerofaciens* (3.21%), and *Bacteroides vulgates* (3.12%).[6] They belong to *Fermicutes* phyla and butyrate producing bacteria. Butyrate is the preferred energy source for the colon epithelial cells, and contributes to the maintenance of the epithelial barrier functions of intestinal mucosa, and has immunomodulatory and anti-inflammatory properties.[7] *Blautia* is considered to control the intestinal immunity. Dietary fiber in brown rice seems to be the most important factor, but other ingredients could influence bacterial co-existence.[8-10] Then, *Bifidobacterium adolescentis* (2.35%) and *B. longum* (1.92%), *Bacteroides uniformis* (2.22%), *B. plebelius* (1.96%), and *B. dorei* (1.71%), and *Akkermansia muciniphila* (2.16%) were followed. Brown rice eaters, compared with the white rice eaters, showed less *Actinobacteria* (12.1 *vs.* 8.5% p=0.078) and *Fusobacterium* (1.6 *vs.* 0.018%, p=0.011). These are pathogenic in intestinal conditions.

So, brown rice could be considered to be typical medical rice by contributing to healthy life.[1] Organic brown rice contains many functional ingredients, such as γ-aminobutyric acid (GABA), γ- oryzanol, ferulic acids with high antioxidant function, in addition to the dietary fiber. The wax-free brown rice is made to improve palatability by scraping the surface wax layer from rice grain. Wax free brown rice contains almost all nutrients of brown rice.

Dietary fibers remained the same as in brown rice, although water-soluble fiber seemed to be more easily dissolved than insoluble dietary fiber during boiling.

From wax-free brown rice a low protein brown rice has been produced.[11-13] The protein in rice is stored in two different types of compartments. The major proteins are prolamin and glutelin. Prolamin is the alcohol soluble protein that remained after salt extraction of globulin. Glutelin is the dilute-acid or dilute-alkaline soluble protein after prolamin extraction. Most of the prolamin is present at the periphery in whole rice grains, so prolamin could be easily removed by the enzymatic digestion on polished white rice, but it has been difficult to remove from brown rice directly. Removal of the wax layer made it possible to immerse the enzyme solution beneath the bran layer. Removal of rice protein yielded low protein brown rice (LPBR) which is beneficial for chronic kidney disease patients.[11]

Medical rice for chronic kidney disease (CKD) should contain enough energy source and low protein, as well as low potassium and phosphate. Reduction of these minerals is a great benefit for CKD patients, because hyperkalemia and hyperphosphatemia are often difficult to avoid when eating meat.[14] Distinct mechanisms of low protein diet for CKD patients are identified, such as improvement of hyperphosphatemia and hyperkalemia, decrease in urinary protein, improvement of subjective symptoms, prevention of complication, and good control even after the introduction of hemodialysis for better survival. Protein overload promotes glomerular hyper-infiltration which causes prefibrotic effects. Recently, the therapy of CKD targeted at reducing hyperfiltration within the glomerular capillaries by using the angiotensin converting enzyme inhibitor or angiotensin receptor blocker to dilate the glomerular arterioles.[15] Other classes of diabetes medications, such as glucagon-like peptide-1 (GLP-1) agonists, peptidase-4 (DPP-4) inhibitors and sodium-glucose co-transporter 2 (SGLT2) inhibitors, are also thought to slow the progression of diabetic nephropathy. However, the dietary therapy is far more cost-effective.[16] High protein diets acutely elevate the glomerular filtration rate, and substitution of low protein brown rice for bread or western foods could delay the progression toward end-stage renal disease.

Looking at the degree of achievement of Japanese rice researches, breeding and production of brand rice, large embryo rice, etc., were developed, and bran-grind (BG) rinse-free rice and wax-free brown rice were elaborated by the rice processing.[17] As Japan becomes a super-aging society, medical expenses are expected to increase by US$ 600 billion in the next ten years and may lead to economic collapse. To this end, we must change to an idea that prevention of illness by dietary lifestyle is superior to the idea that treatment of diseases is only possible by drug therapy.[18]

Basic research on rice function is usually conducted in the university's agronomics and agrochemical department, testing stations and corporate research institutes, and animal experiments are also conducted on functional substances, but knowledge may not be shared among various institutes. Long-term large-scale intervention studies have not been conducted for epidemiological purposes in which humans are at the center of control, and human clinical studies are insufficiently carried out only for the application of supplements.

Integration of these knowledges under the recently established Medical Rice Association by researchers, rice-processing industries, farmers and consumers could produce great energy for building a healthy society.[19] Researchers, farmers, and distributors in Japan were able to establish the association with the purpose of constructing and computerizing the evidence of the fragmentary research, and disseminating it widely to the society. With the cooperation of producers and consumers, standardization of medical rice should enable disease prevention with diet-based evidence for health. Within the association, there will be a research grant committee and a function evaluation committee, and we hope to foster young researchers in this field.

Rice is the main staple food for approximately 70 percent of the world's population, mainly living in ten areas of the Asia-Pacific region. In many countries, rice contributes to overall better health by supplying dietary energy, protein and fat. It accounts for more than 50% of the diet in Bangladesh, Myanmar, Lao People's Democratic Republic, Vietnam and Indonesia.[13] The high prevalence of diabetes among polished white rice eaters has become well-known. Rice with high amylase with a low glycemic index (GI) may be used to prevent diabetes, and high GABA containing large germ rice could contribute to mental health. In this regard, the nutritional aspects of brown rice should be re-evaluated, and further development should produce wonderful medical rice.[20,21]

REFERENCES

1. Watanabe S, Hirakawa A, Nishijima C, et al. Food as medicine: The new concept of "Medical Rice". *Adv Food Technol Nutr Sci Open J.* 2016; 2(2): 38-50. doi: 10.17140/AFTNSOJ-2-129

2. Watanabe S. Pionieer of nutritional science: Sagen Ishizuka. *Clin Funct Nutriol.* 2011; 3(2): 60.

3. Watanabe S. Kenji shoku. *Clin Funct Nutriol.* 2011; 3(2): 60.

4. Watanabe S, Mizuno S, Hirakawa A. Effects of brown rice on obesity: GENKI study I (Cross sectional epidemiological study). *J Obes Chronic Dis.* 2018; 2(1): 12-19. doi: 10. 17756/jocd. 2018-013

5. Watanabe S, Hirakawa A, Mizuno S. Dietary life habits of obese people and brown rice eaters among GENKI study. *Clin Funct Nutriol.* 2018; 10 (2): 79-86.

6. Hirakawa A, Aoe S, Watanabe S, et al. The nested study on the intestinal microbiota in genki study with special reference to the effect of brown rice eating. *J Obes Chronic Dis.* 2019; 3(1): 1-13. doi: 10.17756/jocd.2019-022

7. Duncan SH, Russell WR, Quartieri A, et al. Wheat bran promotes enrichment within the human colonic microbiota of butyrate-producing bacteria that release ferulic acid. *Environ Microbiol.* 2016; 18(7): 2214-2225. doi: 10.1111/1462-2920.13158

8. Shimabukuro M, Higa M, Kinjo R, et al. Effects of the brown rice diet on visceral obesity and endothelial function: the BRAVO study. *Br J Nutr.* 2014; 111(2): 310-320. doi: 10.1017/S0007114513002432

9. Tang G, Wang D, Long J, Yang F, Si L. Meta-analysis of the association between whole grain intake and coronary heart disease risk. *Am J Cardiol.* 2015; 115(5): 625-629. doi: 10.1016/j.amjcard.2014.12.015

10. Masuzaki H, Kozuka C, Okamoto S, Yonamine M, Tanaka H, Shimabukuro M. Brown rice-specific γ-oryzanol as a promising prophylactic avenue to protect against diabetes mellitus and obesity in humans. *J Diabetes Investig.* 2019; 10(1): 18-25. doi: 10.1111/jdi.12892

11. Watanabe S, Hirakawa A, Takei N, Beppu S, Hashimoto H, et al. Medical rice: A new wax-free brown rice and its protein reduced rice. *Adv Food Technol Nutr Sci Open J.* 2018; 4(1): 10-16. doi: 10.17140/AFTNSOJ-4-147

12. Takei N., et al. Low-protein rice (LPR) product: Processing method and product safety. *Adv Food Technol Nutr Sci Open J.* 2017; 3(1): 33-41. doi: 10.17140/AFTNSOJ-3-142

13. Takei N, Kodama S, Hirakawa A, Mizuno S, Saika K, Watanabe S. Medical rice: Brown rice for health and low protein rice for preventing CKD. *EC Nutrition.* 2019; 14(2): 142-150.

14. Watanabe S. Low-protein diet for the prevention of renal failure. *Proc Jpn Acad Ser B Phys Biol Sci.* 2017; 93(1): 1-9. doi: 10.2183/pjab.93.001

15. Palatini P. Glomerular hyperfiltration: A marker of early renal damage in pre-diabetes and pre-hypertension. *Nephrol Dial Transplant.* 2012; 27(5): 1708-1714. doi: 10.1093/ndt/gfs037

16. Chen XM, Huang C, Pollock CA. Current opinion in the treatment of diabetic nephropathy. *Nephrol Open J.* 2015; 1(2): 20-24. doi: 10.17140/NPOJ-1-104

17. Saika K, Watanabe S. Producing rinse-free rice by the bran-grind method: A way to stop environmental pollution from rice industry waste water. *Adv Food Tech Nutr Sci Open J.* 2017; 3(1): 45-50. doi: 10.17140/AFTNSOJ-3-144

18. Mohan V, Spiegelman D, Sudha V, et al. Effect of brown rice, white rice, and brown rice with legumes on blood glucose and insulin responses in overweight Asian Indians: A randomized control trial. *Diabetes Technol Ther.* 2014; 16(5): 317-325. doi: 10.1089/dia.2013.0259

19. Nakamura S, Satoh H, Ohtsubo K. Palatable and bio-functional wheat/rice bread from pre-germinated brown rice of superhard cultivar, EM10. *Biosci Biotechnol Biochem.* 2010; 74(6): 1164-1172. doi: 10.1271/bbb.90850

20. Hudson EA, Dinh PA, Kokubun T, Simmonds MS, Gescher AC. Characterization of potentially chemopreventive phenols in extracts of brown rice that inhibit the growth of human breast and colon cancer cells. *Cancer Epidemiol Biomarkers Prev.* 2000; 9(11): 1163-1170.

21. Tungtrakul P. Innovative rice products in Thailand. Proceedings of the East Asia Conference on Standardization of Rice Function. Kyoto, Japan. 2013: 61-62.