Public health nutrition for chronic disease control and prevention with rice bran and beans

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Abstract

Whole grains and dry beans demonstrate compelling chronic disease fighting properties, yet consumption of these staple foods remain extremely low. A growing community-academic partnership is conducting clinical trials for increased consumption in children to adults. Our main objectives are to: 1) establish feasibility of increased navy bean powder (NBP) and rice bran (RB) intake in children with elevated cholesterol levels (NCT01911390) and adults with a history of colorectal cancer (NCT01929122); 2) examine changes in dietary intake with the addition of RB and/or NBP; and 3) favorably modulate the blood and stool metabolome.

Meals and snacks were developed for inclusion of NBP and/or RB in amounts that were analyzed using NutritionistProTM diet analysis software (Axxya Systems, Redmond, WA). Meats and snacks were developed for inclusion of NBP and/or RB in amounts that were equate to roughly 5-10% of total dietary intake. Participants completed a pilot placebo-controlled, randomized, single-blinded dietary intervention trial. They consumed study meals daily for 4 weeks and recorded 3-day dietary food logs each week. Blood and stool samples were collected at three time points for blood and stool metabolome, and stool microbiome analyses. Adding NBP or RB into foods provided 4-9% daily caloric intake with β3-100% intervention compliance. Dietary intake data at baseline confirms a western dietary pattern including low fiber; high sodium, and high fat intakes. This dietary intervention significantly increased total dietary fiber intakes at 4-weeks (p<0.05). Adding NBP or RB into foods represents an economically feasible and safe approach to achieve dietary intakes that may control or prevent chronic diseases. Our data suggest that NBP and RB are promising solutions that merit public health nutrition education and research attention.

Why rice bran and beans?

Figure 1. Staple foods like rice bran derived from whole grain rice and dry beans merit public health attention for chronic disease prevention, including cardiovascular disease colorectal cancer. (A) One rice variety at each stage of processing for the bran and (B) public health attention for chronic disease prevention, including cardiovascular disease colorectal cancer.

Healthy Hearts

Increasing rice bran and navy bean intake in children with hypercholesterolemia

Healthy Hearts

Table 1. Nutrient composition of one study snack across groups. Recipes were analyzed using NutritionistPro™ diet analysis software (Axxya Systems, Redmond, WA).

Table 2. Participant characteristics of study population at baseline and week 4

Table 3. Macronutrient changes for study intervention from baseline to week 4

Table 4. Participant characteristics of study population at baseline and week 4

Table 5. Selected macro- and micronutrient changes for study intervention over 4 weeks

Figure 3. Participant flow diagram

Figure 4. Feasibility of increasing consumption of rice bran and navy bean powder: Calculating percent intake

Figure 5. Participant flow diagram

Figure 6. Feasibility of increasing consumption of rice bran and navy bean powder: Calculating percent intake

Figure 7. Identification of dietary biomarkers for rice bran and beans associated with precise levels of intake from Healthy Hearts and BENEFIT trials in the next steps prior to implementation of larger scale public health interventions with these foods.

Why rice bran and beans?

Study food development

Figure 2. A registered dietitian and certified chef developed seven meals and six snacks that included the addition of rice bran and/or navy bean powder.

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Conclusions & Future Directions

These results suggest unique phytochemicals and nutrient profiles of rice bran and navy beans may modulate nutrient bioavailability and utilization.

1) Established feasibility of increased navy bean powder and/or rice bran intake in children with hypercholesterolemia and colorectal cancer survivors.

2) Examined dietary intake and baseline and week 4 to understand effects of rice bran and/or navy bean powder on diet composition

3) Further evaluation to identify dietary biomarkers of rice bran and navy bean consumption

4) Additional research in a larger cohort to understand:
   a) blood metabolome profiles on cardiometabolic effects in children with hypercholesterolemia
   b) tissue and stool metabolome profiles on inhibition of recurrence of adenomatous polyps for the prevention of colorectal cancer.

References


