

## ARTICLE

**Creation of Survival Food Recipes by Students in Practicum for a Dietitian Course at University**I. Shimada<sup>1\*</sup>, S. Numata<sup>1</sup>, M. Tanaka<sup>1</sup>, T. Hirouchi<sup>1</sup>, C. Tokuhiko<sup>2</sup>, K. Watanabe<sup>3</sup>, and T. Okamoto<sup>4</sup><sup>1</sup> Department of Nutrition, University of Kochi, Kochi, Kochi, 781-8515, Japan<sup>2</sup> Faculty of Human Life Sciences, Department of Food and Nutrition, Mimasaka University<sup>3</sup> Department of Human Life Sciences, Educational Corporation Kochi Gakuen College, Kochi, Kochi, 780-0955, Japan<sup>4</sup> Faculty of Education, Ehime University, Matsuyama, Ehime, 790-8577, Japan

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After the great earthquake in Tohoku, Japan, 2011, there were increased demands for dietitians who can instruct people on how to survive and eat during hard situations such as restricted water, energy and food. The Food Service practicum of the Faculty of Nutrition at University of Kochi had started lessons for students to make recipes and cooking instructions under some conditions as follows: use of portable gas heaters, canned foods, dry noodles, cooked and dry packed rice, hardtack and dry vegetables. Cooking time should be within 40 minutes because the portable gas stove can run once. Students were not to follow emergency cooking recipes from books so the lectures enhanced them to use their original ideas. From 2012 to 2015, students have made 40 recipes. For staple foods; dry noodles, cooked and dry packed rice and chilled rice were often used. Dry noodles were created to other dishes, such as pizza, and fried rice. Cooked and dry packed rice was used as risotto with dried vegetable and a cube of powdered cooking stock to prevent shortage of fresh vegetables. In main dish, canned mackerel and grilled chicken with carrots and onion, or potato were transformed into stew which was rich with protein and vitamin C. After making recipes and cooking them, students found out how difficult it was to use dry foods because they did not cook at home or at dormitory. Such experience enables students to be competent in instructing those who have to survive to eat after a natural disaster.

**Introduction**

Japan has experienced successive natural disasters in recent years, with major earthquakes occurring particularly frequently.<sup>1</sup> It is essential that Kochi Prefecture is prepared for a Nankai Trough earthquake, which is predicted to occur in the future.<sup>2</sup>

According to a survey conducted by the Japan Dietetic Association in 2011, one month after the Great East Japan Earthquake, meals in the disaster area continued to be carbohydrate-based, such as bread and cup noodles, and fresh foods such as vegetables, meat, fish, and dairy products were not available, which led to protein, vitamin, mineral, and dietary fibre deficiencies.<sup>3</sup> According to the results of a survey on diet and nutritional needs at evacuation shelters in Miyagi Prefecture (Table 1),<sup>4</sup> undernutrition was prevalent at 90% of all shelters, and all nutrients were lacking.

Immediately after a disaster occurs, it is important that people consume sufficient energy and protein to maintain their health and physical strength.<sup>5,6</sup> Vitamins B1 and B2 are required for glucose and lipid metabolism, and care must be taken to avoid deficiency of these nutrients during a disaster, when carbohydrate intake is high.<sup>7</sup> Care must also be taken to avoid a Vitamin C deficiency

because physical and psychological stress results in high consumption of Vitamin C by the human body.<sup>8</sup>

In limited environments, registered dietitians are required to propose meals that taste good and are nutritionally balanced. In order to do this, they must learn how stockpiled foods and everyday foods can be used during a disaster. For this, the Survival Foods Contest is held as a part of disaster education in Food Service Management Practice.

This study aims to analyse the characteristics of and trends in the menus drawn up and implemented by students during their practical training between 2012 and 2015, focusing on the ingredients used, nutritional value, and preparation methods, in order to use this information as a reference in future disaster food proposals.

**Materials and Methods****Overview of survival foods contest**

An annual contest is held at the Faculty of Nutrition, University of Kochi, for third year students (40 students per school year), with the aim of inventing menus that are suitable for ordinary households during a disaster. Assuming a disaster situation, the cost of ingredients is set at no more than 400 JPY per team, the ingredients

that can be used are foodstuff that would normally be stored in a home, such as tinned and dried foods and root crops with a long shelf life. Each team has one portable gas stove as a heat source and a maximum cooking time of 40 minutes.

### Survey subjects and analysis method

From among a total of 67 dishes (Table 2, 43 main dishes containing a staple carbohydrate, 5 main dishes not containing a staple carbohydrate, 4 side dishes 3 soups, and 12 desserts) created between 2012 and 2015, 43 main dishes (containing a staple carbohydrate), which included curry and donburimono (a bowl of rice topped with other ingredients), were analysed in this study. The nutritional value was calculated using a nutrition software (Excel Eiyokun Ver. 6), and the values were compared using one-third of the 'nutrient reference values for evaluating the provision of meals at evacuation shelters (within three months of a disaster)' as the reference values for each meal. Excel 2013 was used for statistical processing.

## Results and Discussion

### Energy

#### *Ingredients used in the main dishes (containing a staple carbohydrate)*

Fig. 1 displays the ingredients used in the main dishes (containing a staple carbohydrate), which would be the main source of energy. The most frequently used ingredient was instant rice, which was used in 25 of the 43 main dishes. The students used instant rice to make inventive and visually appealing dishes, including rice croquettes and mazegohan (rice mixed with other ingredients).

Fig. 1 shows Ingredients used in the main dishes, and the number of dishes the ingredient was used in (total 43).

\*\*Yaki-fu is wheat gluten leavened with baking powder and baked into long.

\*\*Calorie Mate is nutritional supplement.

\*\*\*Asnaro Bread is canned long-life bread (5years).

#### *Comparison of energy content*

Tables 3 and 4 show dishes that provide an energy intake that meets the reference value (670 kcal or more) and dishes that provide an energy intake that does not meet the reference value but is high at 550 kcal or more, respectively. Only the oyaki (a filled dumpling) dish submitted in 2014 satisfied the reference value. A total of five dishes (one in 2012, one in 2013, and three in 2014) provided a high energy intake of 550 kcal or more per meal but did not meet the reference value, and four of these dishes used instant rice. There were no suitable dishes in 2015. Overall, the menus that were drawn up tended to be low in energy content.

**Table 1.** Results of the second survey on diet and nutritional needs at evacuation shelters (Miyagi Prefecture)

	Energy	Protein	VitaminB <sub>1</sub>	VitaminB <sub>2</sub>	VitaminC
Amount of Supply/Day Average (A)	1546kcal	44.9g	0.72mg	0.62mg	32.0mg
Dietary goal for a day (B) (i)	2000kcal	55.0g	1.10mg	1.20mg	100.0mg
Sufficiency rate (A) / (B)	77.3%	81.6%	65.5%	68.3%	32.0%
Ratio of shelters which cannot supply amount of (B)	89.8%	77.9%	87.3%	85.1%	100%

(i) \*Nutrient reference values set as immediate target for planning/evaluating the provision of meals at evacuation shelters (within three months of the disaster occurring) Ministry of Health, Labour and Welfare

**Table 2.** Dishes that provide an energy intake of 670 kcal or more (2000 kcal/day)

Meals	Number of meals
Staple Foods (Not only rice)	43
Main Dishes	5
Side Dishes	4
Soups	3
Desserts	12
Total	67

**Table 3.** Dishes that provide a high energy intake (550 kcal or more), but do not meet the reference value

Year	Names of Recipes	Energy (Kcal)	Energy Sources
2014	Oyaki	704	Flour

**Table 4.** Dishes containing 18 gm or more of protein (55.0 g/day)

Year	Names of Recipes	Energy (kcal)	Energy Sources
2012	Soba Meshi (Rice and Noodle)	588	Instant noodle
2013	Saba ibaru don	564	αRice
2014	20 Mins curry	589	αRice
	Saba ibaru rice	657	αRice
	Dried Curry	589	αRice

**Table 5.** The dish in which tinned food was used effectively ('Survival Mackerel Rice'3. Vitamins

Year	Names of Recipes	Protein(g)	Sources of Protein
2013	Chicken Rice	19.7	Canned yakitori
	Soy source Rice with Ark Shell	18.6	Canned with Ark shell with flavor
2014	Saba Ibaru Rice	33.7	Canned boiled mackerel
	Tori Meshi	21.3	Canned yakitori
2015	Tomato risotto	22.2	Canned tuna Canned clam
	Japanese Tomato risotto	18.3	freeze-dried tofu Canned cooked mackerel with Miso flavor
	Saba Curry	19.0	Canned boiled mackerel

**Table 6.** Dishes containing 0.40 mg or more of Vitamin B2 (1.20 mg/day)

	Energy	Protein	Ca	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin C	Total Fiber	Salt Equivalent
	(kcal)	(g)	(mg)	(mg)	(mg)	(mg)	(g)	(g)
Instant Noodle (75g/back)	336	8.0	143	0.51	0.40	1	1.7	5.2
Saba Meshi (1 dish)	657	33.7	338	0.33	0.43	21	9.6	2.0

Saba Meshi, Tuna, Diced Tomato, Boiled Soybeans  
Carrots, Cooked and Dry-packed Rice

**Table 7.** Dishes containing 33 mg or more of Vitamin C (100 mg/day)

Year	Names of Recipes	Vitamin B <sub>2</sub> (mg)	Sources
2014	Saba ibaru rice	0.43	Canned boiled mackerel
2015	Saba Curry	0.40	Canned cooked mackerel with Miso flavor

**Table 8.** Proposal for disaster food that meets reference values

Year	Names of Recipes	Vitamin C (mg)	Sources
2014	Grilled potato-1	63	Potato
2015	Hamburger steak with freeze dried tofu	36	Potato
	Grilled potato-2	35	Potato

	Energy (kcal)	Protein (g)	VB1 (mg)	VB2 (mg)	VC (mg)
Saba ibaru Rice 1portion	657	33.7	0.33	0.43	21
Saba ibaru Rice (Improved version)	671	32.8	0.38	0.45	38
Dairy dietary goal	670	18.0	0.37	0.40	33

## Protein

### Source of protein in each dish

Fig. 2 is a graph of the protein source in each dish. Tinned ingredients containing animal protein, such as tinned tuna and tinned mackerel, were used frequently, and they accounted for the protein source in 32 of a total of 39 dishes. Ingredients containing vegetable protein were used infrequently, being used in a total of seven dishes—six using tinned boiled soybeans and one using freeze-dried tofu.

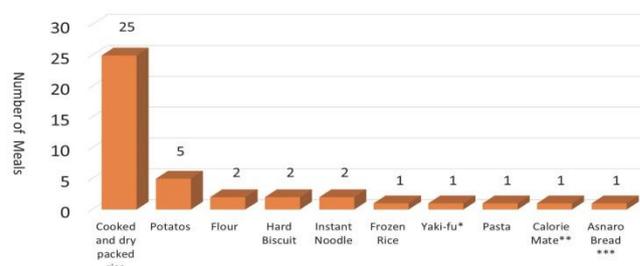
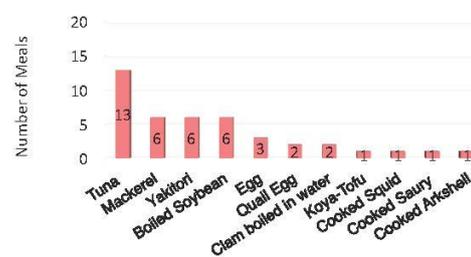
### A comparison of protein content

Table 5 lists the dishes that met the reference value for protein (18 gm or more). There were no dishes that met the reference value in 2012. From 2013 onwards, there were seven dishes that met the reference value—two in 2013, two in 2014, and three in 2015. Tinned food containing animal protein was used in all of these dishes.

### The dish in which tinned food was used effectively

Table 6 is a comparison of the dish with the highest nutritional value from among the dishes that met the reference value for protein and the nutritional value of instant noodles—a food that is frequently consumed during disasters. The dish uses tinned mackerel and so allows high-quality animal protein to be consumed. Also,

the salt equivalent of the dish is lower than that of instant noodles, and because it uses tinned mackerel containing edible bones, the calcium content is high.

**Fig. 1.** The ingredients used in the main dishes**Fig. 2.** The protein source in each dish**Fig. 3.** Survival Mackerel Rice (Improved)

## Vitamins

### Vitamin B1

None of the dishes in this study satisfied the reference value for Vitamin B1 (0.37 mg or more).

### Vitamin B2

Table 7 lists the dishes that met the reference value for Vitamin B2 (0.4 mg or more). There were no dishes that met the reference value in 2012 or 2013. From 2014 onwards, there were two dishes that met the reference

value—one in 2014 and one in 2015. Both dishes used 80 g of tinned mackerel.

### Vitamin C

Table 8 lists the dishes that met the reference value for Vitamin C (33 mg or more). There were no dishes that met the reference value in 2012 or 2013. From 2014 onwards, there were three dishes that met the reference value—one in 2014 and two in 2015. All of these dishes used at least 100 g of potatoes.

### A proposal for disaster food that meets reference values

Table 9 is a proposal for disaster food that meets the reference values. 'Survival Mackerel Rice' was the most nutritious of the 43 main dishes, but it did not meet the reference values for energy, Vitamin B1, or Vitamin C. When 50 g of potatoes are added to this dish, it satisfies the reference values for all nutrients (Fig. 3).

Instant rice was a frequently used ingredient in the main dishes, as it is easy to prepare (by simply adding hot or cold water) and is easy to make into a meal. Because the energy content in the dishes was lower than the reference value, ideas to ensure sufficient energy content are required.

The use of tinned food containing animal protein would prevent people from suffering from weakened immunity, as it would allow them to consume protein, which is often lacking in the diet during a disaster. Also, the use of tinned food containing edible bones allows the consumption of calcium in addition to protein.

Vitamins B1, B2, and C were consistently found to be below the reference value, which proves that these vitamins tend to be lacking in disaster food. Dishes containing Vitamin B2 above the reference value used tinned mackerel, while dishes containing Vitamin C above the reference value used potatoes. These ingredients are considered easy to incorporate into food and are major sources of these vitamins. Tinned food and root vegetables can be stored for long periods, and so can be used during disasters, when it is difficult to obtain fresh ingredients. These results demonstrate that it is necessary to further investigate nutrients that tend to be lacking in foodstuff during disasters and the foods that are rich in these nutrients, and then devise ways to incorporate these ingredients into dishes.

## Conclusions

Because food preparation conditions are different immediately after a disaster and for several months after a disaster, future Survival Foods Contests must establish the period for which a menu should be drawn up (season/number of days after a disaster has occurred), scale (in large quantities or for households), target persons, required nutritional value, volume of water used, available cooking equipment, etc.<sup>9,10</sup> This will make it

possible to propose dishes and cooking methods that suit disaster environments. In order to develop the abilities that registered dietitians require in times of disasters, it is necessary to increase opportunities for students to prepare food and increase their awareness of how stockpiled foods and everyday foods can be used in limited environments.

## Conflict of Interest

All the authors declare that they have no conflict of interest.

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