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Proposal for Disaster Preparedness Food Stockpiles Using Commercially Available Products According to the Living Support Situation "Considering the Availability of Water, Gas, and Electricity"

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Abstract

In recent years, Japan has been hit by numerous disasters, including earthquakes, tsunamis, and floods. Many affected areas have had to endure harsh conditions for long periods of time. Therefore, this study aimed to develop recipes (food combinations) for disaster preparedness, using foods that each household can incorporate into their daily lives as much as possible. Food combinations were created using only foods available at supermarkets (not disaster food kits purchased online) and with an emphasis on incorporating them into daily life. Taking into account the availability of essential commodities such as water, gas, and electricity, three combinations were considered: 1) no water, gas, or electricity; 2) no gas or electricity; and 3) no electricity. Additionally, balance was considered based on nutritional values. Total weight was also recorded. The biggest challenge is the difficulty of staying within the 2025 Japanese Dietary Reference Intake range of 7.5 to 6.5 g of sodium equivalent, and sometimes exceeding 10 g, necessitating careful food selection. Furthermore, each food product did not be label with calcium, vitamin D, amino acid score, allergen, and other information. That information would help maintain a balanced diet even during disasters, contributing to health maintenance and the prevention of Flail and osteoporosis. New product development is needed.

Keyword: Disaster food, Nutrition Facts, Salt equivalent, Stockpiles, General household

1. Introduction

In recent years, Japan has been hit by numerous disasters, including earthquakes, tsunamis, and floods. Many affected areas have had to endure harsh conditions for long periods of time. During the Great East Japan Earthquake, the support that registered dietitians living in the affected areas most needed was food[1)]. Diets tend to be carbohydrate-heavy and nutritionally unbalanced, making it easy for people to fall il[2, 3)]. While the variety and quantity of food can be ensured through the provision of supplements and the arrival and distribution of relief supplies,

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transportation of supplies can be difficult due to factors such as the disruption of sea and land routes[4-8]. Therefore, this study aimed to develop recipes (food combinations) for disaster preparedness, using foods that each household can incorporate into their daily lives as much as possible. We also considered the total weight of food items when carrying them, and report on these findings.

2, Method

Food combinations were created using only foods available at supermarkets (not disaster food kits purchased online) and with an emphasis on incorporating them into daily life. Taking into account the availability of essential commodities such as water, gas, and electricity, three combinations were considered: 1) no water, gas, or electricity; 2) no gas or electricity; and 3) no electricity. Additionally, balance was considered based on nutritional values. Total weight was also recorded.

2.1 How to Make a Shopping List

We have compiled a list of the five major nutrients and other information displayed on foods purchased at the supermarket. (See Table 1)

At that time, we checked whether or not water needed to be added, and also whether or not a heat source such as gas or electricity was required, and compiled the results in a table.
The tables are categorized by staple food, main dish, dessert, sweets, etc., and are put together to make it easier to combine them to plan a meal.

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Tabl.1 Commercially available products purchased form suermarets
(Foods that can be stored at room temperature for more than 6 months)

Water× Gas ×	Water ○ Gas ×	Water ○ Gas ○			Energy kcal	Proteins g	Fat g	Carbohydrates g	Salt equivalents g	Calcium mg
×	○	○		Dry curry	376	6.1	1.1	82	3.5	
×	○	○		Paella style rice	372	6.5	1.1	82.2	3	
×	○	○		Wakame rice	378	6.1	1	82.8	2.1	
×	○	○		Plum kelp rice	261	5.5	0.8	58.1	2	
×	○	○	α-Rice	Shrimp pilaf	378	6.5	1.5	81.5	3.5	
×	○	○		Gomoku rice	380	6.7	1.1	82.1	2.4	
×	○	○		Five-grain rice (Nanakomettsu)	265	6	0.8	58.4	1.5	
×	○	○		Green vegetable rice (Nanakomettsu)	262	4.8	0.8	59	2	
×	○	○		Plum Jako Rice	374	6.8	1	80.6	3.4	
○	○	○		White porridge	84	1.3	0	19.8	0	
○	○	○		Ume porridge	89	1.3	0.3	20.3	1.3	
○	○	○	Retort	Salmon porridge	98	2.8	0.8	19.8	0.9	
○	○	○		Egg porridge	96	3.5	2.5	14.8	1.1	
○	○	○		Brouwn rice porridge	112	1.8	1.3	23.5	0	
○	○	○		Canned bread (coffee)	367	8.8	15.3	48.4	0.592	
○	○	○		Canned bread (raisins)	332	7.3	10.7	50.2	0.572	
○	○	○	Canning	Canned bread (Azuki beans)	385	7.4	16.1	52.7	0.573	
○	○	○		Canned bread (chocolate chip)	380	7.7	15.6	51.3	0.579	
×	×	○		Packed rice (100g)	128	2	0.2	29.7	0.02	
○	○	○		Sukiyaki bowl	155	4.7	6.9	18.5	1.9	
○	○	○		Chinise Bowl	142	4.8	6.3	16.6	2	
○	○	○	Retort	Beef bowl	175	6.9	9.8	14.9	1.9	
○	○	○		Oyakodon	130	10.6	2.5	16.2	1.9	
○	○	○		Curry	154	4	7.1	18.6	2.4	
○	○	○		Pacific saury Kabayaki	240	16.1	16.1	7.8	1.4	220
○	○	○		Simmered sardines in miso	193	15.8	10.9	8	1.5	255
○	○	○	Canning	Sardine flavored	188	15.4	10.9	7.2	1.6	255
○	○	○		Cone meat	154	14	10.5	0.8	1.2	
○	○	○		Tuna	205	13.4	16.8	0.2	0.7	
○	○	○		Fish asusage	123	6.3	6.5	9.9	1.3	350
×	×	○	Dried	Freeze-dried miso soup	29	1.8	0.7	3.8	1.5	
×	○	○	Beverage	Skim milk (1 cup:24g)	86	8.2	0.2	12.8	0.24	288
○	○	○		Vegetable juice	64	2.2	0	14.9	0.4	44
○	○	○		Raisins 5g	17	0.1	0.1	4		
○	○	○	Dried	Cranberry 10g	37		0.2	8.9		
○	○	○		Two Dates (40g)	129	0.9	0.2	32.7	0.01	31
○	○	○		Mixed nuts 30g	208	5	18.7	5		
○	○	○		1/2 Roasted seaweed (2 sheets)	1	0.2		0.3	0.01	
○	○	○		Roasted white sesame seeds	18	0.6	1.6	0.6		2
○	○	○	Dried	Roasted black sesame seeds	19	0.5	1.7	0.6		34
○	○	○		Ground sesame seeds 7g	42	1.4	3.8	1.3		
○	○	○		Green onion 5g	16	0.8	0.1	3	0.04	
○	○	○		Parsley						
○	○	○		Bisco (Strawberry)	105	1.1	4.9	14.6	0.1	116
○	○	○		Bisco (Maple)	105	1.2	5	14.4	0.11	122
○	○	○		Yokan(Azuki beans ber)	175	2.2	0.1	41.4	0.01	
○	○	○	Sweets	Persimmon seeds -style crackers	125	3.4	4.1	18.5	0.59	
○	○	○		Five Chocolates (23g)	135	2.3	9.1	11.4	0.05	
○	○	○		Gummy candy 30g	100	1.7	0.2	22.8	0.01	
○	○	○		Rice cookies	305	2.9	18.1	33.1	0.03	

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3. Results

All food was purchased from supermarkets. The purchased foods consisted of canned, retort pouched, and dried foods. The purchased foods could be stored at room temperature for six months to two years.

3.1 Food combination menus without water, gas, and electricity

When water, gas, electricity, were not available, the calorie count was 1,196g of energy, 1,821kcal, protein 58.9g, fat 81.8g, carbohydrates 217.3g, salt equivalent 6.27g, and calcium 830mg. (See Table 2)

Since the diet was limited to foods that could be eaten immediately, bread, instant porridge, and canned foods were the main choices. Instant porridge is low in calories, so it was necessary to supplement the energy with snacks and other foods.

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Table 2. One day menu and its nutritional value for disaster relief using commercially available foods available at supermarkets (without water, gas, and electricity)

Breakfast	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Canned Bread (Azuki Beans)	385	7.4	16.1	52.7	0.573		100
Vegetable juice	64	2.2	0	14.9	0.4	44	200
Fish sausage	123	6.3	6.5	9.9	1.3	350	70
5 Chocolates (23g)	135	2.3	9.1	11.4	0.05		23
Total	707	18.2	31.7	88.9	2.323	394	393

Lunch	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Brouwn rice porridge	112	1.8	1.3	23.5	0		250
Roasted black sesame srrds 3g	19	0.5	1.7	0.6		34	3
immered sardines in miso	193	15.8	10.9	8	1.5	255	100
2 Dates (40g)	129	0.9	0.2	32.7	0.01	31	40
Total	453	19	14.1	64.8	1.51	320	393

Dinner	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Egg porridge	96	3.5	2.5	14.8	1.1		250
1/3 roasted seaweed 2sheet	1	0.2		0.3	0.01		2
Cone meat	154	14	10.5	0.8	1.2		80
Bisco (Strawberry)	105	1.1	4.9	14.6	0.1	116	21.5
Total	356	18.8	17.9	30.5	2.41	116	353.5

Snacks	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Rice cookies	305	2.9	18.1	33.1	0.03		56

One day	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
	kcal	g	g	g	g	mg	g
Total	1,821	58.9	81.8	217.3	6.27	830	1,196

*Since the diet was limited to foods that could be eaten immediately, bread, instant porridge, and canned foods were the main choices. Instant porridge is low in calories, so it was necessary to supplement the energy with snacks and other foods.

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3.2 Food combination menus without gas, and electricity

When water was added, the calorie count was 2,124 kcal, protein 70.2 g, fat 59.3 g, carbohydrates 320.9 g, sodium equivalent 10.15 g, calcium 860 mg, and total weight 1,172 g. (See Table 3)

The emergency food was mainly made from instant rice, and the energy content increased significantly, but the salt content also increased significantly.

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Table 3. One day menu and its nutritional value for disaster relief using commercially available foods available at supermarkets (without gas, and electricity)

Breakfast	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Canned bread (coffee)	367	8.8	15.3	48.4	0.592		100
Skim milk (1 cup:24g)	86	8.2	0.2	12.8	0.24	288	24
Fish sausage	123	6.3	6.5	9.9	1.3	350	70
Total	576	23.3	22	71.1	2.132	638	194
						* Addition of water 200ml	

Lunch	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Gomoku rice	380	6.7	1.1	82.1	2.4		100
Roasted white sesame seeds 3g	18	0.6	1.6	0.6		2	3
Pacific saury Kabayaki	240	16.1	16.1	7.8	1.4	220	100
Cranberry	37		0.2	8.9			10
Total	675	23.4	19	99.4	3.8	222	213
						* Addition of water 120ml	

Dinner	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Dry curry	376	6.1	1.1	82	3.5		100
Raisins 5g	17	0.1	0.1	4			5
Tuna	205	13.4	16.8	0.2	0.7		70
Yokan (Red beans)	175	2.2	0.1	41.4	0.01		60
Total	773	21.8	18.1	127.6	4.21	0	235
						* Addition of water 140ml	

Snacks	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Gummy candy 30g	100	1.7	0.2	22.8	0.01		30

One day	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
	kcal	g	g	g	g	mg	g
Total	2124	70.2	59.3	320.9	10.152	860	672
						** Addition of water 500ml	

The emergency food was mainly made from instant rice, and the energy content increased significantly, but the salt content also increased significantly.

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3.3 Food combination menus without electricity

When water and gas were added, the calorie count was 1,433 kcal, protein 55.3 g, fat 45.0 g, carbohydrates 203.9 g, sodium equivalent 8.30 g, calcium 830 mg, and total weight 1,582 g. (See Table 4)

It is now possible to cook using a portable stove, and pre-packaged rice and ready-made side dishes can be used without any problems. Being able to eat hot food is expected to increase the satisfaction of meals.

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Table 4. One day menu and its nutritional value for disaster relief using commercially available foods available at supermarkets (without electricity)

Breakfast	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Packed rice (200g)	128	2	0.2	29.7	0.02		100
Freeze-dried miso soup	29	1.8	0.7	3.8	1.5		8.1
Sardine flavored	188	15.4	10.9	7.2	1.6	255	100
Skim milk (1 cup:24g)	86	8.2	0.2	12.8	0.24	288	24
Total	431	27.4	12	53.5	3.36	543	232.1
						* Addition of water 360ml	

Lunch	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Packed rice (100g)	128	2	0.2	29.7	0.02		100
Oyakodon	130	10.6	2.5	16.2	1.9		210
Mixed nuts 30g	208	5	18.7	5			30
Total	466	17.6	21.4	50.9	1.92	0	340

Dinner	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Packed rice (100g)	128	2	0.2	29.7	0.02		100
Curry	154	4	7.1	18.6	2.4		180
2 Dates (40g)	129	0.9	0.2	32.7	0.01	31	40
Total	411	6.9	7.5	81	2.43	31	320

Snacks	Energy	Protein	Fat	Carbo-hydrates	Salt equivalent	Cal-cium	Weight
Product name	kcal	g	g	g	g	mg	g
Persimmon seeds rice crackers	125	3.4	4.1	18.5	0.59		30

One day	Energy	Protein	Fat	Carbo- hydı	Salt equivalent	Cal-cium	Weight
	kcal	g	g	g	g	mg	g
Total	1433	55.3	45	203.9	8.3	574	922.1
					** Addition of water 360ml		
All three meals as 200g of rice	1,817	61.3	45.6	293	8.36	574	1,222

It is now possible to cook using a portable stove, and pre-packaged rice and ready-made side dishes can be used without any problems. Being able to eat hot food is expected to increase the satisfaction of meals.

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4. Discussion

The biggest challenge is the difficulty of staying within the 2025 Japanese Dietary Reference Intake range of 7.5 to 6.5 g of sodium equivalent, and sometimes exceeding 10 g, necessitating careful food selection9). Furthermore, each food product must be labeled with calcium, vitamin D, amino acid score, and other information. During a disaster, both disaster victims and people working in the affected areas (such as local government officer, fire brigade members, medical personnel, and employees of lifeline companies) are prone to stress, insomnia, loss of appetite, fatigue, constipation, irritability, physical and mental weakness, and weakened immunity10-17).
Regular eating habits are also important, and people who do not normally pay attention to a balanced diet will not be able to eat a balanced diet during a disaster18). In the event of a disaster, cooperation with public institutions sach as the national and prefectural governments is necessary to secure food supplies19).

Displaying allergen information would help maintain a balanced diet even during disasters, contributing to health maintenance and the prevention of frailty and osteoporosis. New product development is needed.

It is possible to stockpile food items that can be purchased at supermarkets and other stores in preparation for disasters. Even those with a short shelf life can be stored at room temperature for six months (the longest shelf life was five years). Energy intake was 1433-2124 kcal per day (a 1433 kcal menu could be increased to 1817 kcal by having rice for all three meals).
Many foods do not display calcium content, making it difficult to take measures to prevent frailty and osteoporosis. Vitamin content is also not displayed, so supplements may be necessary. During a disaster, people spend a lot of time indoors, so it is thought that there will be an increased need to obtain vitamin D, which is necessary for preventing osteoporosis, like calcium, from food, but it is difficult to judge because it is not labeled.

If each food item were labeled with calcium and vitamin D, as well as amino acid scores and allergy information, we believe that better food combinations would lead to a balanced diet and healthy living, even during a disaster. Furthermore, we believe that by increasing the number of low-salt foods, we can create an environment that naturally leads to health. There is an urgent need to develop foods that can be stored at room temperature for long periods and have a allergy-free, low-salt, amino acid score of 100, calcium and vitamin D content indication.

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