1. SUMMARY

The ketogenic diet with Ketonformula (Ketonformula KD) is a sort of modified Classic Ketogenic Diet (Classic KD). Under Classic KD, patients may face the difficulties to compliance with and continue to follow the rigid rules of KD such as rule to use up fat as a form of vegetable oil, fresh cream or mayonnaise, and rule to control various kinds of side effects by proper supplements such as multivitamins, trace minerals and calcium and etc.

According to Dr. Kodama, to overcome those difficulties, Ketomeal (preform of Ketonformula) was developed about 30 years ago by Wakodo Co., Ltd. with the help of the Department of Pediatrics of Kobe University. The Department of Pediatrics of Kobe University decided to replace the long-chain triglycerides (LCT) with as much Medium-Chain Triglycerides (MCT) as possible since MCT could be said to be more ketogenic than LCT, so that patients could eat a wider variety of anti-ketogenic foods such as fruit and vegetables. Also, Ketomeal contained as much multivitamins, trace minerals and calcium and etc. as possible for proper supplements. In current situation, Ketomeal was taken over by Ketonformula produced by Meiji Dairies Corporation.

By replacing such dietary fats as vegetable oil, fresh cream or mayonnaise with Ketonformula, patients can overcome those difficulties, and to continue KD until patients can be satisfied with the efficacy of KD by controlling seizures caused by intractable epilepsy.

2. PRIMARY IMPRESSIONS OF CLASSIC KD

Prior to embarkation on Classic KD, the dietitians shall provide patients with explanations and instruction of Classic KD.

In Japan, diabetes is one of the most famous diseases that could be controlled by the dietary therapy. There are a lot of skilled and experienced dietitians for diabetes therapy. On the other hand, anticonvulsant medicines are regarded as the most suitable treatment to treat epilepsy seizure. KD is not common among the dietitians. Since there are few dietitians who are equipped with expertise of KD, and also there are a few materials of KD, it is very difficult for patients to have concrete image of KD before starting KD therapy. The inexperienced dietitians have usually explained Classic KD as “100g of fresh cream for breakfast”, and “50g of fried egg with 2g of butter, and 50g of bean sprouts, 25g of cabbage stir-fried with 6g of margarine for lunch” by using the only instruction book of KD issued by Dr. Maruyama in 1973.

Also, the inexperienced dietitians have instructed patients by using only the words and sentences written on the book, but positive images of KD. The dietitians tend to inform patients of negative rules and rigid rules for Classic KD as follows.

- Don’t eat sweets.
- Don’t eat rice, bread and noodle.
- Don’t guesstimate amounts of foods.
- Don’t take medicines contain carbohydrate such as syrup.

It is very difficult for patients to have concrete and positive images of Classic KD under the instructions made by inexperienced dietitians.

3. NEGATIVE IMPRESSIONS OF CLASSIC KD

The negative impressions toward Classic KD might be planted deeply in patients’ minds as a result of insufficient and unsuitable instructions for new candidates of Classic KD.

The examples of negative impressions are as follows.

- Rigid procedure to develop each meal plan by following doctors’ instruction of Recommended Daily Allowance (RDA) of calories and ketogenic ratio
- Strict rules to prepare each meal of Classic KD
- Strict test for urinary ketone level
- Unpalatable and oily foods

- Side effects
- Eating KD all
- Shortage of such nutritional elements as calcium and water-soluble B and C vitamins

4. BASIC TECHNIQUES TO OVERCOME NEGATIVE IMPRESSIONS

In order to embark on Classic KD, patients shall be required to have basic techniques to overcome negative impressions and sort of fears toward Classic KD as follows.

- Technique to weigh all ingredients accurately

  Patients must buy a digital gram scale. The digital gram scale is more convenient than the analog scale to weigh several ingredients consecutively by adding one by one since the digital one has reset-function.

  When patients want to weigh the used grams of vegetable oil, they can utilize reset-function. Before they use oil, oil bottle shall be put on scale and be reset (“0g”). After they use oil, oil bottle shall be put on scale again, and scale will show you the used grams like “-5g”.

- Technique to arrange the most suitable environment for patients to compliance under minimum temptations and interruptions

  In order to avoid any temptations to eat other foods than Classic KD, different room and different dining time schedule for patients from other family membes must be arranged especially at the introduction stage of KD.

  In order to prevent such accidents that grandparents give snacks to patients, knowledge of Classic KD must be shared among patients’ family and neighborhood including grandparents and classmates at schools.

- Technique to make more palatable menus and more similar menus to family’s

  Parents of patients must be imaginative and creative. Parents and dietitians are expected to develop Classic KD menus by taking account of children’s needs, favors and pre-diet eating habits. They must select dishes that are familiar and resemble their families’ normal meals.

5. GENERAL RULES TO DETERMINE BASIC MEAL PLAN FOR CLASSIC KD

(1) ESTIMATING CALORIC NEED

The first step is to estimate caloric need for each patient. In order to determine the caloric requirement of an individual patient, the following elements must be considered.

① Age
② Current and desirable weight in KG
③ Active level

The estimated caloric needs for each age, weight and active level are showed on the chart of RDA of calories or standard of caloric needs for Japanese published by Ministry of Health, Labor and Welfare.

A child who is 7 years old with 25kg weight and very active behavior shall be a candidate for example. The estimated caloric need for this candidate is 1,600kcal according to RDA of calories.

(2) SETTING THE DESIRED KETOGENIC RATIO

When a child begins Classic KD as an outpatient, ketogenic ratio of Classic KD will be starting from 1:1 to 2:1, 3:1 and 4:1.

The example is the case that a physician orders a dietitian to develop the basic menu for KD with 1,600kcal and ketogenic ratio 2.5:1.

(3) FINDING OUT THE BASIC MEAL PLANS

The chart of basic meal plans for KD is introduced as a part of "Guideline for dietary therapy" published by Nutrition section of Hyogo Prefectural Kobe Children's Hospital in 1988.

The example is the basic meal plan for KD with 1,600kcal and ketogenic ratio 2.5:1 as follows.

Classic KD 2.5 : 1 (K : AK) 1,600kcal/day

Basic Ingredients	Weight (g)	Calorie (kcal)	Protein (g)	Fat (g)	CHO※ (g)
Fresh Cream (45%)	235	1,018	4.7	105.8	7.3
Vegetable oil	20	184	-	20.0	-
Processed cheese	15	51	3.4	3.9	0.2
Coarse-grained Tofu	80	62	5.4	4.0	0.6
Horse mackerel	40	58	7.5	2.8	-
Beef (with fat)	60	100	12.1	5.2	0.2
Egg	60	97	7.4	6.7	0.5
Cabbage	200	48	2.8	0.2	9.8
Miso	10	19	1.3	0.6	1.9
Total amount		1,637	44.6	149.2	20.5
Ratio by weight (g)			11%	84%	5%

※ CHO : Carbohydrate

The dietitian shall divide basic meal plan per day into desired number of meals and snacks per day. The number of meals will be determined based on the child's dietary habits, and shall usually be divided into breakfast, lunch, dinner and a snack in Japan.

6. GENERAL RULES TO DEVELOP ACTUAL MEAL PLANS

(1) HAND CALCULATION TO DEVELOP ACTUAL MEAL PLANS

In order to develop actual meal plans by using basic meal plan, the way to exchange or transform basic ingredients to various kinds of ingredients for actual meal plan must be acquired. There are three kinds of exchange group, those are to say, Fat exchange group, Protein exchange group and CHO exchange group. Each exchange group consists of exchange list for each basic ingredients that belong to such group. The followings are excerpts from "Guideline for dietary therapy" published by Nutrition section of Hyogo Prefectural Kobe Children's Hospital in 1988.

① Fat exchange group

(a) Exchange list for Fresh Cream 5g

Ingredient	Gram	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)
Fresh Cream	5	22	0.1	2.3	0.2
Mayonnaise	3.5	24	0.1	2.6	0.1
Butter	3	22	-	2.4	-
Margarine	3	23	-	2.5	-
Vegetable oil	2.5	23	-	2.5	-

(b) Exchange list for Vegetable oil 5g

Ingredient	Gram	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)
Vegetable oil	5	46	-	5.0	-
Mayonnaise	7	49	0.1	5.3	0.2

Ingredient	Gram	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)
Margarine	6	46	-	4.9	-
Butter	6	45	-	4.9	-
Lard	5	47	-	5.0	-
Shortening	5	46	-	5.0	-

② Protein exchange group

(a) Exchange list for Processed cheese 5g

Ingredient	Gram	Oil ±	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)	K/AK
Processed cheese	5		17	1.1	1.3	0.1	2.0
Coarse-grained tofu	15		21	1.0	1.8	0.1	2.3
Egg	10	+1	16	1.2	1.1	0.1	1.7
Vienna sausage	5		15	0.7	0.2	0.2	2.0
Beef (with fat)	5	+1	18	1.0	-	-	2.4
Horse mackerel	5	+1	16	0.9	-	-	2.4

(b) Exchange list for Coarse-grained tofu 20g

Ingredient	Gram	Oil ±	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)	K/AK
Coarse-grained tofu	20		15	1.4	1.0	0.2	1.5
Tofu less	10	+1	18	0.5	1.4	0.6	1.4
Boiled soya bean	5	+1	18	0.8	1.5	0.4	1.7
Miso	2	+1	13	0.3	1.1	0.4	1.7
Egg	10		16	1.2	1.1	0.1	1.7
Horse mackerel	10		14	1.9	0.7	-	1.3
Beef (with fat)	10		17	2.0	0.9	-	1.3
Processed cheese	5		17	1.1	1.3	0.1	1.9

(c) Exchange list for Horse mackerel 20g

Ingredient	Gram	Oil ±	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)	K/AK
Horse mackerel	20		29	3.7	1.4	-	1.3
Cuttlefish (Squid)	25	+1	28	3.9	1.3	-	1.2
Salmon	20		33	4.1	1.7	-	1.3
Shrimp	20	+1	28	4.1	1.1	-	1.2
Canned tuna in oil	15	−1	34	3.6	2.0	-	1.4
Tuna (with fat)	15	−2	30	3.2	1.7	-	1.4
Beef (with fat)	20		33	4.0	1.7	0.1	1.3
Egg	25	−1	31	3.1	1.8	0.2	1.4

(d) Exchange list for Egg 20g

Ingredient	Gram	Oil ±	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)	K/AK
Egg	20		32	2.5	2.2	0.2	1.7
Yellow of egg	15	−3	27	2.3	1.7	0.1	1.6
White of egg	15	+3	35	3.1	3.0	0.1	1.8
Beef (with fat)	15	+1	34	3.0	2.3	0.1	1.7

(e) Exchange list for Beef (with fat) 20g

Ingredient	Gram	Oil ±	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)	K/AK
Beef (with fat)	20		33	4.0	1.7	0.1	1.3
Bacon	30	−10	35	3.9	1.7	0.1	1.3
Beef mince	25	−4	36	4.5	1.8	-	1.3
Pork mince	25	−3	38	4.6	2.0	-	1.4
Pork (with fat)	20		38	3.8	2.3	0.1	1.4
Chicken (with fat)	20	−1	33	3.7	1.8	-	1.4
Vienna sausage	20	−3	33	2.6	2.0	0.8	1.2
Egg	25	−1	31	3.1	1.8	0.2	1.4

③ CHO exchange group

(a) Exchange list for Cabbage 20g

Ingredient	Gram	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)	AK
Cabbage	20	5	0.3	-	1.0	1.2
Lettuce	50	6	0.8	0.1	0.8	1.3
Cucumber	55	6	0.6	0.1	0.9	1.3
Bean sprouts	30	5	0.7	-	0.7	1.1
Tomato	30	5	0.2	-	1.0	1.1
Green pepper (Paprika)	25	5	0.2	-	1.1	1.2
Onion	15	5	0.2	-	1.1	1.2
Carrot	20	6	0.2	-	1.2	1.3
Mushroom	30	-	1.2	0.2	0.5	1.2
Apple	10	5	-	-	1.3	1.3
Strawberry	15	5	0.1	-	1.1	1.2
Orange	13	5	0.1	-	1.2	1.3

(b) Exchange list for Miso 5g

Ingredient	Gram	Calorie (Kcal)	Protein (g)	Fat (g)	CHO (g)	AK
Miso	5	10	0.6	0.3	1.0	1.4
Ketchup	5	6	0.1	-	1.4	1.5
Sugar-cut (Saccharin)	15	5	-	-	1.3	1.3

(2) COMPUTER CALCULATION FOR CONFIRMATION

In order to simplify the mathematics and calculation, figures on exchange lists are rounded. Since the hand calculation method is not so rigid, there might be the difference on calories and ketogenic ratio between the basic meal plan and the actual meal plan.

The computer calculation method can find the discrepancy on the result of hand calculation and can adjust the figures on the actual meal plan to keep desirable ketogenic ratio.

In Japan, for the computer calculation method, it is common to use the software called “Food Supporter”, which is complimentary CD-ROM software of the book and costs about USD14.00. Since the computer program uses data about the precise nutritional content of specific ingredient used in each meal plan, the computer program gives us the total amount of Calorie, Protein, Fat and CHO of each meal plan. After the computer calculation, ketogenic ratio can be calculated by using the calculation formula (Ketogenic ratio = 0.9F+0.46P / CHO+0.1F+0.58P) with Microsoft excel.

Display of “Food Supporter”

7. DIFFICULTIES ON CLASSIC KD

Under Classic KD, in order to achieve the optimal seizure control, it is highly expected to keep ketogenic ratio as at least 3:1. 3:1 Classic KD consists of 10% of Protein, 87% of Fat and 3% of CHO. On 3:1 Classic KD, it might be very difficult to find out such places as ice cream to hide fat in foods. Also, on 3:1 Classic KD, it is very difficult to make meals as palatable with a lot of fat and a few of CHO and protein.

Moreover, with 3% of CHO, it is very difficult to have enough dietary fiber to keep good condition of bowel and to prevent constipation.

The 3:1 Classic KD might be deficient in such nutrients as calcium, water-soluble B and C vitamins. It is necessary to supplement the KD with the daily administration of these vitamins and calcium. The 3:1 Classic KD contains 10% of Protein, and generally speaking, 10% of Protein shall be regarded as enough volume to keep good condition of growth. But, more than 10% of Protein is highly expected for better growth.

8. DEVELOPMENT OF KETONFORMULA KD

In order to overcome the difficulties of Classic KD, Ketonformula, that is sort of specially designed milk for KD, was developed in Japan. 100 g of Ketonformula consists of 15g of Protein, 71.8g of Fat and 8.8g of CHO with 741.00kcal and 2.92 ketogenic ratio. MCT is regarded as more ketogenic than LCT, then Ketonformula is expected to contain as much MCT as possible, and finally, balance of 71.8g of Fat was determined as 39.7g of MCT and 32.1g of LCT. From our experience in Japan, it is said that 2.5:1 Ketonformula KD has the same effect to control seizure as 3:1 Classic KD. Since Ketonformula contains MCT, fluids are not restricted on Ketonformula KD.

Moreover, Ketonformula is supplemented with many kinds of nutritional additions such as calcium, multivitamin with minerals. The details are as follows.

Nutritional ingredient	Unit	in 100g	Nutritional ingredient	Unit	in 100g
Protein	g	15.0	Vitamin K	μg	30.0
Fat	g	71.8	Pantothenic acid	mg	2.0
CHO	g	8.8	Niacin	mg	6.0
Ash content	g	2.4	Folic acid	mg	0.2
Water	g	2.0	Calcium	mg	350.0
Calorie	kcal	741.0	Magnesium	mg	36.0
Vitamin A	μgRE	600.0	Sodium	mg	165.0
Vitamin B1	mg	0.6	Potassium	mg	470.0
Vitamin B2	mg	0.9	Phosphor	mg	240.0
Vitamin B6	mg	0.3	Chlorine	mg	320.0
Vitamin B12	μg	4.0	Iron	mg	6.0
Vitamin C	mg	50.0	Copper	μg	350.0
Vitamin D	μg	12.5	Zinc	mg	2.6
Vitamin E	mg	6.0			

Package of Ketonformula

Appearance of Ketonformula

In order to use Ketonformula for KD, dietitians are highly expected to modify the basic meal plan to exchange parts of such fat ingredients as fresh cream and vegetable oil into Ketonformula. The following is an example of modification of basic meal plan with 1,600kcal and ketogenic ratio 2.5:1.

Basic Ingredients	Weight (g)	Calorie (kcal)	Protein (g)	Fat (g)	CHO (g)
Ketonformula	60	445	9.0	43.1	5.3
Fresh Cream (45%)	110	431	7.5	43.1	3.2
Vegetable oil	40	368	-	40.0	-
Processed cheese	10	34	2.3	2.6	0.1
Coarse-grained Tofu	70	50	4.6	2.9	1.1
Horse mackerel	40	48	8.3	1.4	-
Beef (with fat)	60	109	12.7	5.8	0.3
Egg	65	98	8.0	6.7	0.2
Cabbage	100	23	1.3	0.2	5.2
Sugar-cut (Saccharin)	6	8	-	-	2.1
Total amount		1,614	53.7	145.8	17.5
Ratio by weight (g)			14%	81%	5%

The modified basic meal plan for a day shall be divided into the desired number of meals and snacks per day, those usually are breakfast, lunch, dinner and one snack. The modified basic meal plan for lunch with 1,600kcal and ketogenic ratio 2.5:1 is shown below as an example.

Basic Ingredients	Weight (g)	Calorie (kcal)	Protein (g)	Fat (g)	CHO (g)
Ketonformula	10	74	1.5	7.2	0.9
Fresh Cream (45%)	40	157	2.7	15.7	1.2
Vegetable oil	10	92	-	10.0	-
Beef (with fat)	30	55	6.4	2.9	0.2
Egg	40	60	4.9	4.1	0.1
Cabbage	30	7	0.4	0.1	1.6
Sugar-cut (Saccharin)	2	3	-	0.1	0.7
Total amount		448	15.9	40.1	4.7
Ratio by weight (g)			15%	81%	4%

9. INVENTION OF KETON COOKIES

On Ketonformula KD, 10g of Ketonformula has usually been dissolved in 100cc of hot water like baby milk formula for drink. This milk has unique and unpalatable smell, so it is very difficult for children to continue to drink Ketonformula milk every day or in every meal. By using speck of pure

cocoa or instant coffee, dietitians have tried very much to diminish unique and unpalatable smell, but the improvement of smell has not been enough to make children positive to drink Ketonformula milk.

Under these situations, dietitians and parents of children have worked very hard to find out effective ways to hide Ketonformula into foods, and finally, a parent luckily to invent the way to make "Keton cookies" by using Ketonformula as like wheat flour.

Keton cookies can be modified to Keton pancake, Keton bread, Keton pizza by changing the balance of Ketonformula, Fresh cream and Egg. Since Ketonformula and Fresh cream are Fat, the places to hide Fat are secured. Some of the recipes are shown as follows.

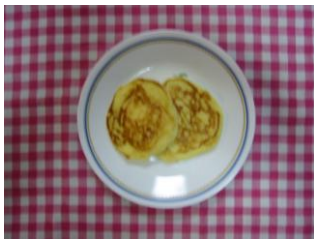
Food	Keton -formula (g)	Fresh Cream (g)	Egg (g)	Other ingredients
Keton Cookies	20	5	5	Vanilla essence, Sugar-cut
Keton Pancake	20	15	15	Vanilla essence, Sugar-cut
Keton Pizza	20	15	15	Consommé powder, Processed cheese, Bacon, Tomato, Paprika, Onion
Keton Bread	20	10	10	Consommé powder, Parmesan cheese, Butter, Macadamia nuts

Keton Cookies 1st Step

2nd Step

3rd Step

Keton Pancake 1st Step



2nd Step

10. BASIC INSTRUCTIONS TO MAKE KD PALATABLE

Following are tips from dietitians to make KD palatable.

(1) Low-carbohydrate flavoring or seasoning can be regarded as "free", which is to say not affecting the ketogenic balance of the meal. Low-carbohydrate flavoring or seasoning includes the speck of consommé powder, salt, pepper, soy sauce, vanilla extract, etc.

(2) High-carbohydrate flavoring or seasoning can be used a tiny pinch as "free", but it is better to be substituted for sugar-cut (Saccharin) or Cabbage. High-carbohydrate flavoring or seasoning includes ketchup, Worcester sauce, sake, gelatin, etc.

(3) Sugar-cut (Saccharin) can be used to add sweet taste as substitute for sugar.

(4) Under Ketonformula KD, fluids are not restricted. Fluids should be taken as such non-carbohydrate drink as Water, Green tea, Black tea, Coffee, etc.

(5) Fresh cream originated from vegetable might be better for health.

11. PRACTICAL RULES TO DEVELOP EVERYDAY MEALS

Under Ketonformula KD, nearly all the foods patients like can be transformed into a KD meal by reflecting individual or family preference. Each ingredient in basic meal plan can be transformed to other specified ingredients necessary for everyday meals by using exchange lists.

The details of transformation shall be shown by using practical example. A certain lunch of certain family on certain day consists of (A) Italian spaghetti, (B) marinated squid and (C) pizza. This lunch can be transformed into 2.5:1 Ketonformula KD.

The basic meal plan for lunch with 1,600kcal/day and 2.5:1 is as follows.

Basic Ingredients	Weight (g)	Calorie (kcal)	Protein (g)	Fat (g)	CHO (g)
Ketonformula	10	74	1.5	7.2	0.9
Fresh Cream (45%)	40	157	2.7	15.7	1.2
Vegetable oil	10	92	-	10.0	-
Beef (with fat)	30	55	6.4	2.9	0.2
Egg	40	60	4.9	4.1	0.1
Cabbage	30	7	0.4	0.1	1.6
Sugar-cut (Saccharin)	2	3	-	0.1	0.7
Total amount		448	15.9	40.1	4.7
Ratio by weight (g)			15%	81%	4%

Above mentioned each basic ingredient must be transformed into necessary ingredients to make (A) Italian spaghetti, (B) marinated squid and (C) pizza as KD. The details of transformation are shown as follows.

Basic Ingredients	Basic (g)	Food	Used (g)	Actual ingredients	Actual (g)	Hand calculation
Ketonformula	10	(A)	5	Ketonformula	5	
		(C)	5	Ketonformula	5	
Fresh Cream (45%)	40	(C)	15	Fresh Cream	15	
		(C)	24	Ketonformula	15	24÷8×5=15
Vegetable oil	10	(A)	2.5	Fresh Cream	5	2.5÷2.5×5=5
		(B)	1	Butter	1	1÷5×6=1.2
		(B)	5	Olive oil	5	
Beef (with fat)	30	(A)	5	Roast ham	5	
		(A)	5	Vienna sausage	5	
		(A)	3	Parmesan cheese	3	
		(B)	8	Squid	10	8÷20×25=10
		(C)	6	Vienna sausage	6	
		(C)	3	Parmesan cheese	3	
Egg	40	(A)	20	Egg	20	
		(C)	15	Egg	15	
		(C)	5	Vienna sausage	4	5÷25×20=4
Cabbage	30	(A)	5	Onion	4	5÷20×15=3.75
		(A)	5	Carrot	5	5÷20×20=5
		(A)	5	Paprika	6	5÷20×25=6.25
		(B)	5	Paprika	6	5÷20×25=6.25
		(B)	5	Cucumber	14	5÷20×55=13.75
		(B)	5	Mushroom	7	5÷20×30=7.5
Sugar-cut (Saccharin)	2	(A)	2	Ketchup	1	No calculation
		(A)		Worcester sauce	1	(Computer
		(B)		Lemon juice	1	Calculation)

Reference:

1) 1g of Fresh cream and 1.5g of vegetable oil are not used up during hand calculation transformation since transformation of Beef ⇒ham, sausage, cheese and Egg ⇒sausage may cause more than -2g of oil adjustment.
2) Such high-carbohydrate flavoring or seasoning as Ketchup, Worcester sauce and lemon juice can be used a tiny pinch as "free", but it is better to be substituted for sugar-cut (Saccharin) by computer calculation, but hand calculation.

As a result of hand calculation transformation, the actual meal plan for lunch is developed as follows.

Food	Ingredient	Gram	Recipe
(A) Italian spaghetti	Egg	20	**Keton pasta** Pan-fry a paper-thin omelet, and cut a omelet into fine strips.  Stir-fry sliced ham, sausage and vegetables, and mix all ingredients with ketchup, sauce and cheese topping.
	Ketonformula	5	
	Fresh cream	5	
	Roast ham	5	
	Vienna sausage	5	
	Onion	4	
	Carrot	5	
	Paprika	6	
	Ketchup	1	
	Worcester sauce	1	
	Parmesan cheese	3	
(B) Marinated squid	Squid	10	Boil squid, and cut squid into pieces. Cut vegetables into strips, and stir-fry them with butter. Mix all ingredients with olive oil and lemon juice.
	Paprika	6	
	Cucumber	14	
	Mushroom	7	
	Butter	1	
	Olive oil	5	
	Lemon juice	1	
(C) Pizza	Ketonformula	20	**Keton Pizza dough** Pan-fry a thin pancake, and put sliced sausage and parmesan cheese as toppings. Toast pizza in an oven.
	Egg	15	
	Fresh cream	15	
	Consommé powder	T.P	
	Pepper	T.P	
	Salt	T.P	
	Vienna sausage	10	
	Parmesan cheese	3	

T.P : Tiny pinch

As a result of computer calculation, total amount of Protein, Fat, CHO and Calorie can be accumulated, and by using these figures, ketogenic ratio can be calculated. The result of computer calculation of above mentioned meal plan is showed as follows.

Calorie	Protein	Fat	CHO	Ketogenic ratio
481.49kcal	15.91g	43.28g	6.44g	2.31

12. EXAMPLES OF PRACTICAL MEALS

(1) Breakfast

Food
Keton Cookie
Fried sausage
Cut cheese
Salad
Milk coffee
Strawberry

Calories	459.05kcal
Protein	13.17g
Fat	42.49g
CHO	6.01g
Ketogenic Ratio	2.48

(2) Lunch

Food
Italian spaghetti
Marinated squid
Keton pizza

Calories	481.49kca
Protein	15.91g
Fat	43.28g
CHO	6.44g
Ketogenic Ratio	2.31

(3) Dinner

Food
Hamburger steak
Pork soup
Ham salad
Keton cookie

Calories	673.69kcal
Protein	24.51g
Fat	60.00g
CHO	6.37g
Ketogenic Ratio	2.46

13. SPECIAL FOODS FOR SPECIAL DAYS

During the KD therapy, patients are prohibited to have high-carbohydrate foods such as rice, bread, pasta, snacks, sweets, etc. In order to keep compliance with strict rules to be followed during the KD therapy, patients tend to avoid various kinds of special occasions. At friend's birthday party, birthday cake might be served and be shared among friends. At Christmas party, children might enjoy eating Christmas cake, fried chicken and Macdonald hamburger.

The reconciliation and disappointment caused by KD might discourage patients to continue KD. The dietitians and parents are expected to be creative by using their imagination.

On Ketonformula KD, it is very easy to make Keton pancake. By using 2 pieces of pancake, whipped fresh cream with sugar-cut and some pieces of cut-strawberry can be "Birthday cake". By using 2 pieces of Consommé flavored pancakes, hamburger steak, cheese, lettuce, tomato and mayonnaise can be "Macdonald Hamburger". Be creative!

(1) Birthday cake

(2) Hamburger

14. SCHOOL LUNCH

When patients start school life, parents are usually obliged to prepare “KD lunch box” everyday. It will be big burden for parents to develop suitable meal plans for everyday school lunch.

In order to ask schools to serve specially prepared KD lunch for patients, parents must have consultation with schools to find out the way to cope with budget problem. KD lunch meal plans must be developed by using the same ingredients as used in normal lunch. Under Ketonformula KD, ingredients in basic meal plan will be transformed to some of the ingredients used in normal lunch. Since the volume of ingredients used in KD might be much smaller than in normal lunch, there might be remains of budget. By using the remains of budget, parents can ask schools to purchase such extra ingredients as fresh cream, mayonnaise, etc. only used for KD. Ketonformula must be brought to schools by parents.

The followings are examples of normal lunch and KD lunch which are developed based on the same meal plan for school lunch.

(1) Normal lunch

(2) KD lunch

15. EFFICACY OF KETONFORMULA KD

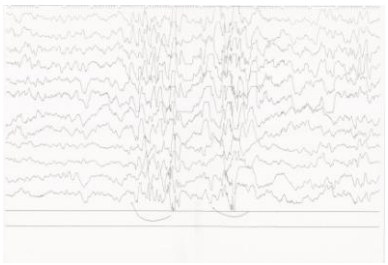
By controlling seizures caused by intractable epilepsy, patients can be free from the damages on their brains and they can attain remarkable growth of their intelligence level. The growth of intelligence level might be confirmed by day-by-day changes of their face expression. The followings are some examples.

Before KD

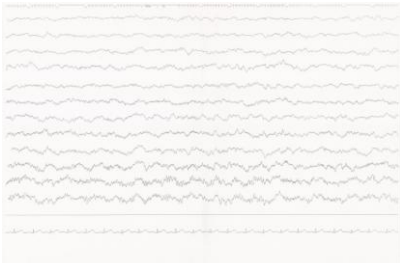
After 6 months KD

After 3 years KD

Moreover, seizure control by KD might improve the condition of EEG. The followings are some examples.



Before KD



After 3 years KD

16. CONCLUSION

In Japan, KD therapy is regarded as one of the most difficult dietaries therapy since there are a few skilled or experienced dietitians and a few experiences of KD in Japan. Under Classic KD, the dietitians and parents might face a lot of difficulties to use up fat as a form of vegetable oil, fresh cream or mayonnaise, and to control various kinds of side effects by proper supplements such as multivitamins, trace minerals and calcium and etc. Moreover, under Classic KD, at least 3:1 Ketogenic ratio must be kept to expect the effective and efficient seizure control. Under 3:1 KD, it is very difficult to make palatable meal plans with about 10% of Protein, 87% of Fat and 3% of CHO.

On the other hand, under Ketonformula KD, it is relatively easy to use up fat as a form of ketonformula by making Keton cookie, Keton pizza, etc. Since ketonformula is supplemented with many kinds of nutritional additions such as calcium, multivitamin with minerals, basically there is no need to control various kinds of side effects by proper supplements.

In addition to those advantages, since ketonformula contains certain amount of MCT, it is said that 2.5:1 Ketonformula KD can produce almost the same keton bodies as 3:1 or 4:1 Classic KD. Under 2.5:1 KD basic menu, it is relatively easy to make palatable and acceptable actual menus for everyday life by using logical and systematic hand calculation transformation method with the confirmation by computer calculation method.

Under Ketonformula KD, it is expected that many patients would overcome the difficulties of KD, and in near future, Ketonformula KD would be one of the most effective treatments for intractable epilepsy and difficult-to-control seizure in Japan.

This paper was prepared by Mr. Hiroyuki Nakatsuta, who experienced in Ketonformula KD in Japan for about three and half years, based on his own understandings, opinions and experiences.