Calorie Answer CA-Hi

Nutrition analysis by NIR technology

Agenda

1. 제조사 소개

2. Calorie Answer란?

3. Calorie Answer의 원리 및 측정법별 비교

4. Calorie Answer의 구성 및 사용법

5. 신제품(CA-Hi) 소개

6. Calorie Answer의 활용방안

7. Q&A

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제조사

Company name : Joy World Pacific Co., Ltd
Location   : Aomori Prefecture, Japan
Establishment   : October, 1978
Business   : Manufacture optical device, Software,
                          Hardware development

History
1998   -   Start to develop a device to measure Calorie
2006   -   First model CA-HN in the market
2011   -   Second model CA-HM in the market

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What is Calorie Answer?

●kcal
●Protein(g)
●Fat(g)
●Carbohydrate(g)
●Moisture(g)
●Alcohol (g/%)

1. Measure standard cell
2. Homogenize and grind sample
3. Put the sample in cell and measure
4. Analysis time is 80 sec.

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Calorie Answer의 특징

- ✓ **Use Near Infrared Light**

- ✓ **Quick and easy measurement operation**

- ✓ **Possible to measure nutrition of food without knowing those recipes**

- ✓ **Nondestructive and Non-contact Inspection**

- ✓ **Patented Technology**

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Calorie Answer의 원리

White Light

Prism

White Light：
All the colors mixed looks white.
Different wavelength makes
different color.

Pass the light through
prism and colors
separates like rainbow

↓

Spectroscopy
(Diffraction)

Visible Light

UV

NIR   **FIR**

400   *700*   *3000[nm]*

wavelength

Short   **Long**

Calorie Answer의 원리

Luminous source

AOTF

NIR

Light detector

Absorbance of each wavelength

$$\frac{\text{Transmitted or Reflected Light Strength}}{\text{Strength of Irradiation}} = \text{Absorbance}$$

Absorbance

Wavelength

Absorbance at these points are used to calculate calories.

Different wavelength

Different frequency of molecules

Light wave length A,B and D are extinguished by resonance

＝ Absorbance

A B C D

irradiation

Resonance & Absorbance

A' B' C' D'

Transmitted & Reflected

Measure the absorbance ratio of reflected or transmitted light at each irradiated wavelength.

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칼로리 측정법 별 비교

Calculate nutrition value based on database

Company A

Company B

		Calorie（kcal）		Carbohydrate（g）		Protein（g）		Fat（g）	
Marinated Spinach	Calculation	30.4	A/B	7.9	A/B	3.0	A/B	0.4	A/B
	A	34.0		4.7		2.9		0.4	
	B	68.1	100%	11.5	145%	4.4	52%	0.5	25%
Fried Chinese Noodle(Salty)	Calculation	170.4	A/B	14.8	A/B	5.1	A/B	5.7	A/B
	A	168.0		14.9		4.5		8.9	
	B	173.8	4%	18.0	21%	6.1	36%	4.4	14%
Spaghetti Napolitans	Calculation	245.2	A/B	35.8	A/B	7.5	A/B	7.2	A/B
	A	145.0		23.2		6.1		3.1	
	B	181.7	25%	29.4	27%	6.8	12%	4.1	32%

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칼로리 측정법 별 비교

USDA United States Department of Agriculture
Agricultural Research Service
National Nutrient Database for Standard Refe

| NDL Home | Food Search | Nutrients List | Ground Be |

Enter one or more terms

Restaurant, Chinese

Try a new search

ⓘ 19 foods found Click on a food name to view details

NDB No. ▼	Description
36603	Restaurant, Chinese, beef and vegetables
36617	Restaurant, Chinese, lemon chicken
36620	Restaurant, Chinese, shrimp and vegetables
36626	Restaurant, Chinese, chicken and vegetables
36629	Restaurant, Chinese, orange chicken
36601	Restaurant, Chinese, egg rolls, assorted
36618	Restaurant, Chinese, general tso's chicken
36619	Restaurant, Chinese, kung pao chicken
36621	Restaurant, Chinese, sweet and sour chicken
36622	Restaurant, Chinese, sweet and sour pork
36623	Restaurant, Chinese, chicken chow mein
36602	Restaurant, Chinese, fried rice, without meat

What ingredient is used?
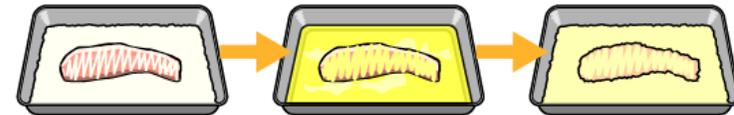
Fried rice with meat!!
But no data in database.

How much oil is absorbed?

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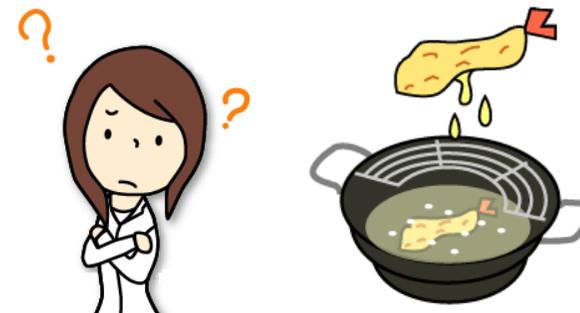
칼로리 측정법 별 비교

	Time	Sample prep	Accuracy	Cost	Repeatability
Laboratory based analysis	X	X	◎	X	??
Database analysis	△	◎	△	◎	??
Calorie Answer	◎	○	○	○	◎

◎ : Excellent　　○ : Good　　△ : Poor　　X : Bad

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Example to distinguish Sucrose and Glucose

Absorption spectrum

Second derivative spectrum
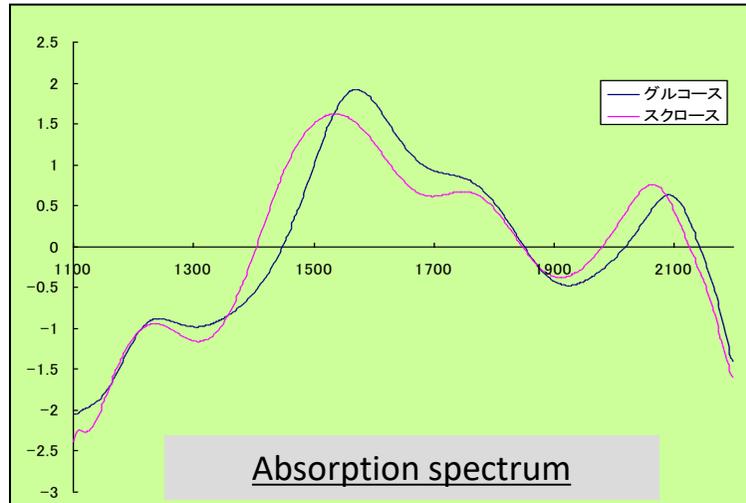
Similar
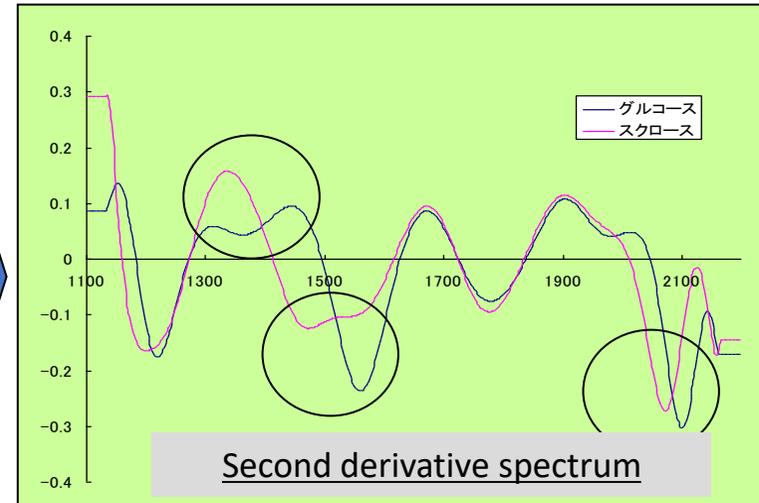
Breakdown

Food ingredients are divided into individual component information

Food component

Preinstalled Analytical curve

Multiple regression analysis

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Measurement mode

| Many food type, component type, form type | → | Choose best measurement mode depends on food type |
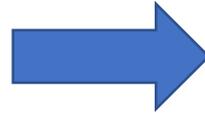
Preinstalled standard mode

Processed foods	Reflection
Snacks	Reflection
Confectionaries	Reflection
Soft drinks	Penetration
Coffee drinks	Penetration

Other mode(option)
Potatoes or starches, Sugars, Beans
Nut, Vegetables, Mushrooms
Seaweeds, Fishes, Meats, Eggs

Additional mode(option)

Cereals	
Cereals SCREENING(also powdered rice)	Reflection
Cereals(under 200kcal)	Reflection
Powdered Cereals, Dried noodles	Reflection

| Dairy product	
Yogurt	Reflection
Cheese	Reflection
Powdered milk	Reflection
Yogurt drink	Penetration
Lactic acid bacteria beverage	Penetration
Ice cream, Condensed milk	Penetration
Milk(w/o sugar added)	Penetration
Milk(w/ sugar added)	Penetration
Milk(Whipping cream)	Penetration

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Test result 1

Calorie — R² = 0.9821

Protein — タンパク質の相関　n=29 — R² = 0.9327

Fat — 脂質の相関　n=29 — R² = 0.9744

Carb — 炭水化物の相関　n=29 — R² = 0.9447

Moisture — 水分の相関　n=20 — R² = 0.9681

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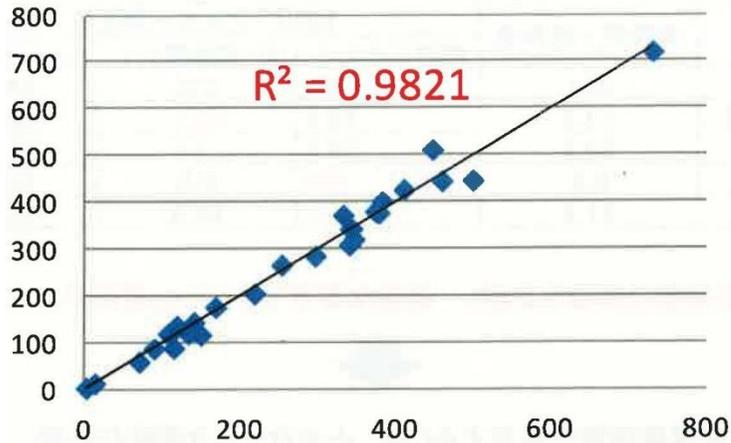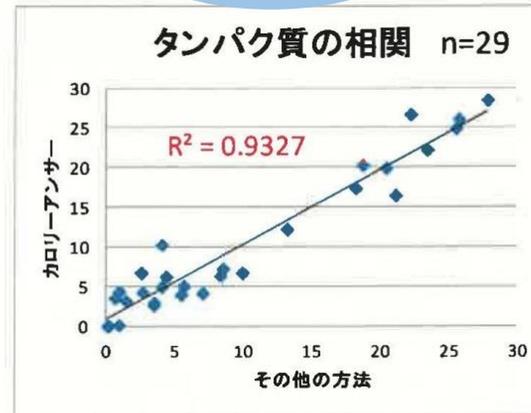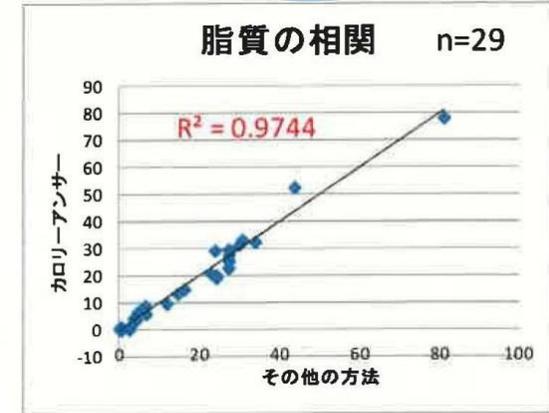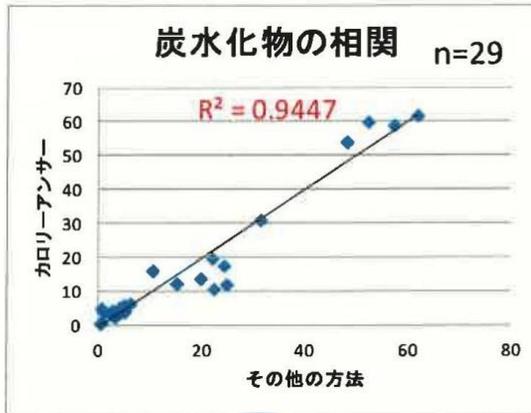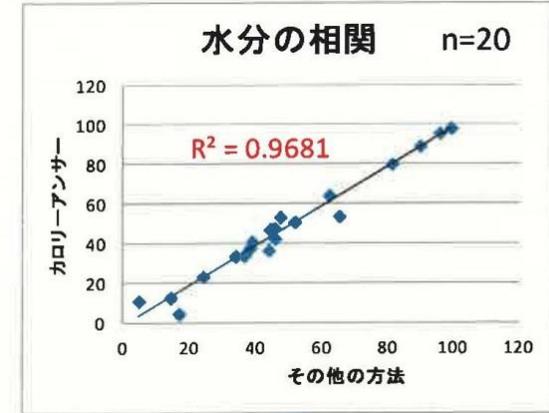
Test result 2

Butter	Calorie(kcal)	Protein(g)	Fat(g)	Carb(g)	Moisture(g)
Database	745	0.6	81	0.2	16.2
Ave of CA-HM	712	0	78.5	1.6	14.7
Difference Database vs. CA	4%	N.D	3%	88%	10%
CA Measure 1st	(711)	(0.0)	(78.3)	(1.6)	(14.0)
CA Measure 2nd	(716)	(0.0)	(79.0)	(1.3)	(15.0)
CA Measure 3rd	(711)	(0.0)	(78.2)	(1.8)	(15.0)

Beer	Calorie(kcal)	Protein(g)	Fat(g)	Carb(g)	Moisture(g)
Database	40	0.3	0	3.1	92.8
Ave of CA-HM	39	0	0	3.3	92.0
Difference Database vs. CA	2%	N.D	0%	6%	1%
CA Measure 1st	(37)	(0.0)	(0.0)	(2.8)	(93.0)
CA Measure 2nd	(37)	(0.1)	(0.0)	(2.8)	(92.0)
CA Measure 3rd	(43)	(0.0)	(0.0)	(4.2)	(91.0)

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Test result 3

Biscuit	Calorie(kcal)	Protein(g)	Fat(g)	Carb(g)	Moisture(g)
Database	432	7.6	10.0	77.8	2.6
Ave of CA-HM	434	8.3	12.9	71.0	3.0
Difference Database vs. CA	0.5%	8%	23%	10%	14%
CA Measure 1st	(434)	(8.4)	(12.8)	(71.3)	(3.0)
CA Measure 2nd	(434)	(8.4)	(12.9)	(71.1)	(3.0)
CA Measure 3rd	(433)	(8.2)	(13.1)	(70.7)	(3.0)

Bread	Calorie(kcal)	Protein(g)	Fat(g)	Carb(g)	Moisture(g)
Database	264	9.3	4.4	46.7	38.0
Ave of CA-HM	286	11.8	8.8	39.9	38.7
Difference Database vs. CA	8%	21%	50%	17%	2%
CA Measure 1st	(286)	(12.0)	(8.8)	(39.7)	(38.0)
CA Measure 2nd	(286)	(11.7)	(8.9)	(39.9)	(39.0)
CA Measure 3rd	(286)	(11.6)	(8.8)	(40.0)	(39.0)

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System configuration

PC is not included in the system.

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# How to sample preperation
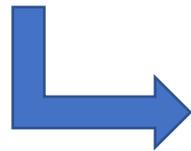
Homogenize sample

Reflection measurement

Penetration measurement

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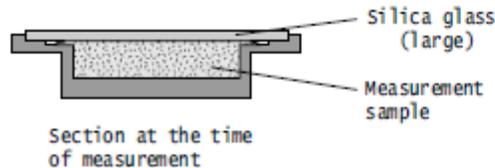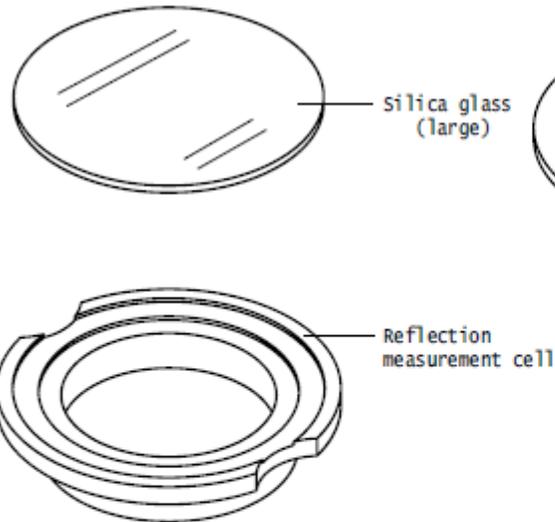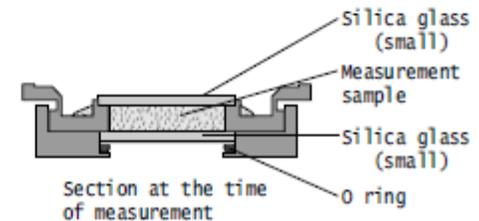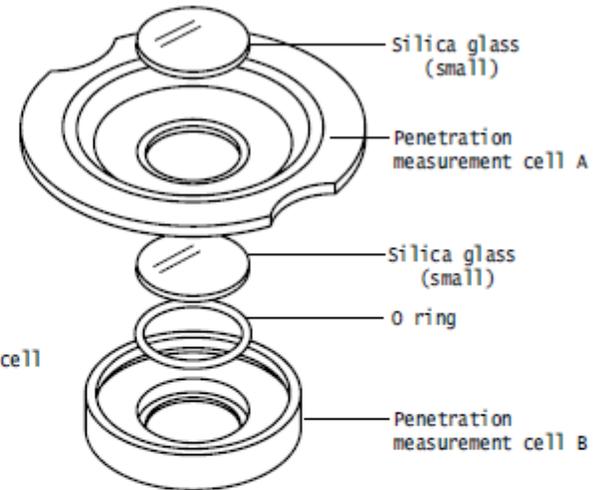
Sample analysis

Reference cell measurement   Sample measurement
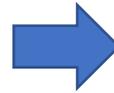
Reflection measurement

Measure without cell
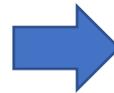
Penetration measurement

Only 5 min for analysis!!

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Output data

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Improvement CA-Hi

1. Reference cell measurement

-Reference cell은 최초 1회만 측정➜총 측정시간 감소
(최초 측정 약 80초, 후속 측정 약 80초 소요)

2 . Analysis of Liquid sample

-"transmission reflection method(투과반사법)"을 사용
➜액체가 내부로 새는 것을 방지

3. Analysis mode

-기존장비: 6가지 측정모드 선택, 설치
➜calibration curve creation software 설치가능
multiple measurement modes(측정모드에 제한이 없음)

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New Software

3. 波形表示
(파형데이터표시)

5. 検量線作成
(분석곡선작성)

7.測定値
(측정치)

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What the system cannot do

Zero-Calorie

Black Color Foods

Count calorie of unavailable carb
due to molecule that consists of sugar.

Black color food absorb light well results
in poor reflection light.

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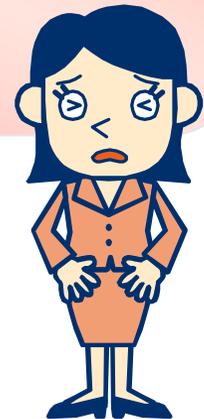
Low digestionable carb

Food containing unavailable carb, such as erythritol

**Unavailable carb
Is low digestion by human
such as sugar alcohols or
Artificial sweeteners**
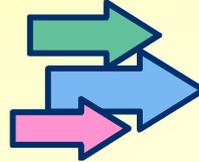
**Erythritol : 0kcal/g
Agar
Maltitol : 2kcal/g
Sorbitol : 3kcal/g
Xylitol**

**Calorie : 352 kcal
Protein : 6.2g
Fat : 24.1g
Carb : 27.5g
Moisture : 41%**

Use Erythritol (14g)

14g of Erythritol is
contained in 27.5g of Carb

Manual
calculation

**Available calorie for human is
296 kcal
(352 – 14 X 4)**

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Use for

Displaying Nutrition Value

New Products Development or Quality control

Nutrition intake counseling

- ✓ Display of calorie and nutrition value
- ✓ New product, new recipe developments
- ✓ Quality Control
- ✓ Nutrition management by checking leftover foods

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Cooking method, ingredients for low calorie

- ➢ Ingredients?
- ➢ Cooking method?

- ➢ What kind of oil?
- ➢ How much oil absorbed?

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Use for Calorie management

- Precise calorie management for dieter, athlete
- Unique concept restaurant, training gym

Spaghetti Napolitano
12kcal

Hamburg steak
15kcal

Low calorie restaurant 『etsu』
In general, calorie restricted diet is considered "unsavory". This restaurant serves low calorie, savory dish. They also sells unique food stuff for making low calorie food in home.

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Calorie answer User

Advertisement 4%

Others 11%

Supermarket 27%

Restaurant 17%

Food industry 19%

Academic 22%

CNT International
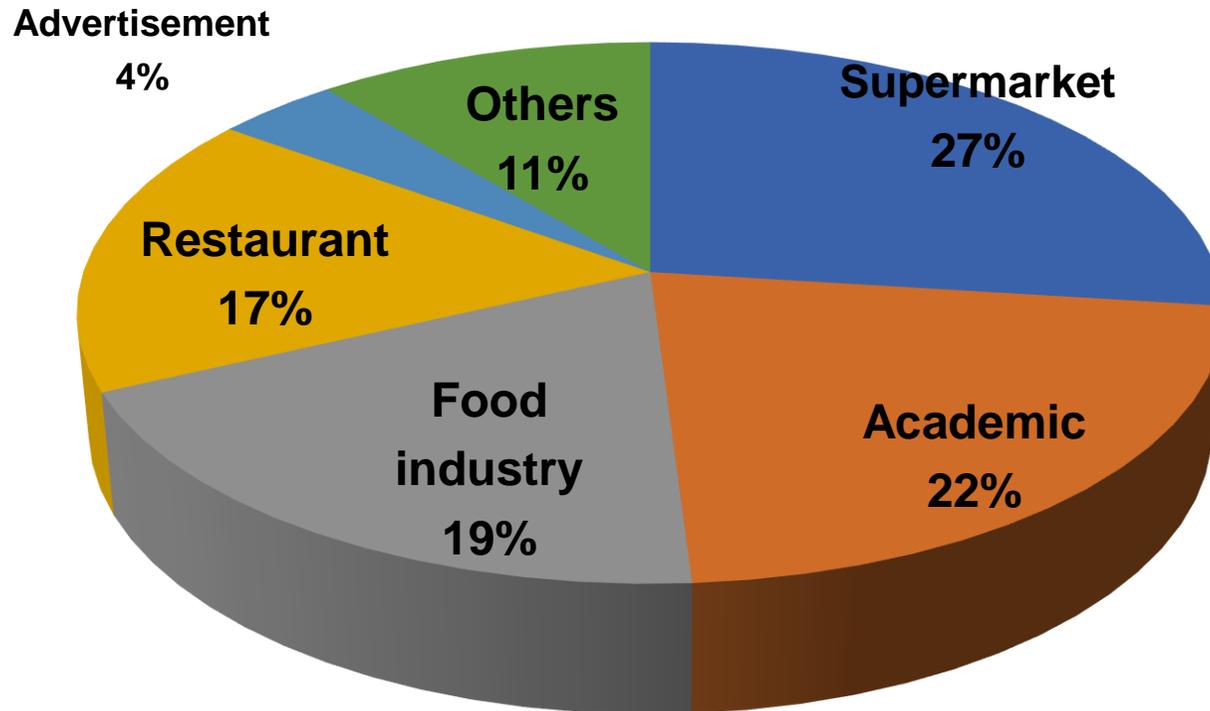
Best for

Purpose	Object	Effectiveness
• Display of calorie • Insistence of company stance • Increase efficiency of dietitian • Substitution of physicochemical analysis	• Restaurant chain • Daily foods shops	• Increase of consumer sufficient • Increase of marquee • Cost down
• New product development • Development of cooking devices • Manufacturing process control • Control of raw materials	• Restaurant Chain • Food industries • Electronic industries • Cooking devices maker	

CNT International

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