

Food Variety as Nutritional Therapy



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Consuming a diet containing an adequate variety of foods has been shown to be associated with improved health outcomes. Moreover, evaluating an individual's food variety is a simple task that provides a key component of a more wide-ranging nutritional assessment. The results of this assessment can then be used in counselling patients about their food intake and implementing nutritional therapy.



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In an affluent society there is usually an enormous variety of foods available for consumption. Despite this variety, individuals may choose foods which supply an excessive amount of one or more nutrients, such as fat, salt and alcohol.^[1] As a consequence, affluence has been associated with increases in non-communicable diseases that can in part be attributable to diet and sedentary lifestyles.

Food Variety

Definition

Food variety can be defined in a number of ways. It can relate to the intake of foods that are biologically diverse, such as bananas and carrots, or that are nutritionally distinct from each other. The five food groups are broad categories of foods which differ nutritionally. Even within these groups, however, food processing can alter the characteristics of a food such that the same food can be classified differently according to how it is processed. For example, soya beans can be cooked and eaten whole, consumed as a fermented paste (miso), or eaten in the form of beancurd (tofu).

Public Health Implications

Many developed countries, including Australia, Germany, Netherlands, Sweden and Japan,

have established their own sets of dietary guidelines. These guidelines are intended to encourage intake of foods (and sometimes nutrients) that will assist in the maintenance of good health, and to discourage food intake that will not. Eating a wide variety of foods is

SALIENT POINTS

- Despite the enormous variety of foods available in affluent societies, individuals in these societies may choose potentially harmful diets characterised by low food variety
- Encouraging the consumption of a wide variety of foods is a feature common to all dietary guidelines
- Eating a wide variety of foods lessens the likelihood of consuming excessive amounts of potentially toxic substances and increases the likelihood of receiving an adequate and well-balanced intake of essential nutrients
- Several studies have shown food variety to be an important predictor of health outcomes
- Dietary food variety can be measured with a food diary or a food variety checklist completed for 7 days
- Particular care is needed when assessing and advising individuals who may be at increased risk of receiving inadequate nutrition, such as the elderly, vegetarians, people with medical conditions such as coronary heart disease, and the obese
- A comprehensive nutritional assessment of any individual can be made by elucidating his or her medical history, food intake (including food variety score), physical status, and the results of appropriate investigations



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one dietary guideline that is common in each of these countries.^[2] The basis for such a guideline relates to a number of factors, of which perhaps the most important relates to nutritional adequacy. Most nutrition experts would agree that a nutritionally adequate diet (after the first few months of life) is best achieved by consuming a diverse range of foods. This concept has been supported by the results of a number of studies that have assessed nutritional quality through a food variety approach.^[3-5]

Most nutrition experts would agree that a nutritionally adequate diet is best achieved by consuming a diverse range of foods

Food variety may also lessen the likelihood of consuming an excess of substances that may be potentially toxic.^[6] Moreover, it increases the likelihood that individuals will receive an adequate and well balanced intake of essential nutrients.^[7]

Measurement of Food Variety

Several approaches have been taken to measure food variety in diets. A numerical score can be given for each food consumed that differs according to the criteria used to define food variety. Each type of food consumed is scored once over a set time period such as a day, a week, a month, or a year. The score is tallied and used to assess the nutritional quality of a diet. An intake of 15 or more different foods per week or more than 12 foods in one day usually characterises a diet adequate in essential nutrients.^[8]

Food variety has also been scored by counting the number of food groups eaten over one day and then scoring additional points for the number of serves consumed within each group. Once the desirable number of serves has been reached, scoring ceases.^[9]

Food Variety as a Predictor of Clinical (Health) Outcomes

Several studies have shown food variety to be an important predictor of health outcomes. For example, food variety has been associated with less macrovascular disease. In a study exploring the variance in arterial wall compliance with food variety in subjects with type II diabetes and their healthy controls, a more favourable relationship was found among those consuming the greatest food variety.^[10]

A lack of food variety has been associated with an increased risk of mortality

A lack of food variety measured simply by food groups alone has been associated with an increased risk of mortality. Findings from the National Health and Nutrition Examination

Survey (NHANES) I Epidemiologic Follow-up Study (NHEFS) showed that, in men, the age-adjusted mortality from cardiovascular disease, cancer and other causes was inversely related to their food variety. In women, a similar association was found in relation to cardiovascular disease and other causes, but not cancer.^[11]

In a cohort study involving elderly, rural Greek subjects, higher food variety scores were significantly associated with a reduction in overall mortality. The risk of death was reduced by 17% in subjects with an increase in diet score of one and by 50% in those with an increase of four.^[12] This study demonstrated that the sum of the diet was greater than its parts – another feature of a diet characterised by variety since such a diet will be more likely to realise synergy among food components. For example, combined intake of phyto-oestrogens and calcium may achieve more for bone health than would be expected from the aggregate effect of each by itself.

Assessing food variety is a quick, simple and, in most cases, accurate method of determining the nutritional adequacy of a diet

Clinical Applicability of Indices of Food Variety

Assessing food variety is a quick, simple and, in most cases, accurate method for determining the nutritional adequacy of a diet.

Two approaches that will help doctors and other health professionals measure food variety are use of a food diary or a food variety checklist over a 7-day period. Seven days is a useful length of time to measure food intake as this generally reflects usual intake. The choice of method will depend on time considerations, the information required and the willingness of the patient.

A 7-day food diary record will highlight meal patterns but will require a certain degree of cooperation by the patient. Accurate and full descriptions of foods eaten (such as low-fat, fried) and the quantities consumed (in household measures) will provide useful information, especially if counselling is needed. If a food record is used, the food variety score can be calculated by scoring one point for every different food that appears over the 7-day food record period. Table I shows a food record sample in which a food variety score of 35 was achieved over 3 days.

While a food variety checklist (Table II) omits useful information, it requires little patient effort and can be filled in (and assessed) immediately. Patients using the checklist are asked to tick (once only) all the foods they remember consuming in the past week and then total the score.

Table 1. Sample food record (only three days shown)

	Day 1	Score	Day 2	Score	Day 3	Score
Breakfast	Corn Flakes (cup)	1	Weet-Bix × 2	*	Muesli (½ cup)	1
	Banana × 1	1	Milk (½ cup)	*	Milk (½ cup)	*
	Milk (½ cup)	1	Sugar (1 teaspoon)	*	Stewed apple (¼ cup)	*
	Sugar (1 teaspoon)	1	Toast × 2	*	Toast × 2	*
	Toast (white) × 2	1	Margarine (2 teaspoons)	*	Margarine (2 teaspoons)	*
	Margarine (2 teaspoons)	1	Poached egg × 1	1	Vegemite (1 teaspoon)	1
	Jam (1 tablespoon)	*	Coffee and milk	*	Coffee and milk	*
	Coffee and milk	1				
Snack	Coffee and milk	*	Coffee and milk	*	Coffee and milk	*
	Sweet biscuit × 1	*			Peanuts (small packet)	1
Lunch	Ham (1 slice)	1	Baked beans (½ cup)	1	Salmon (2 tablespoons)	1
	Tomato (½ medium)	1	Toast × 2	*	Salad roll (white)	*
	Bread × 2 (wholemeal)	*	Carrot cake (1 slice)	*	Beetroot (2 slices)	*
	Flavoured milk (small carton)	*	Tea and milk	*	Tomato (4 slices)	*
	Apple × 1	1			Lettuce (2 leaves)	*
	Tea	*			Onion (2 rings)	*
	Milk	*			Orange juice (1 glass)	*
					Small packet of sultanas	*
				Tea and milk	*	
Snack	Coffee and milk	*	Coffee and milk	*	Coffee and milk	*
	Yoghurt (acidophilus) tub	1	Biscuit & cheese (1 slice)	*	Apple × 1	*
Dinner	Water	1	Chicken (1 × breast)	1	Beer (1 glass)	*
	Steak (120g)	1	Stir-fried vegetables:		Spaghetti (1½ cups)	1
	Potato (1 medium)	1	- Onion (½ small)	1	Bolognese sauce (⅔ cup) *	
	Pumpkin (½ cup)	1	- Carrots (½ cup)	*	Lettuce (2 leaves)	*
	Broccoli (2 stalks)	1	- Snow peas (× 6)	*	Tomato (½ medium)	*
	Peaches (2 halves)	1	- Spinach (½ cup)	1	Cucumber (5 slices)	*
	Ice cream (2 tablespoons)	*	- Mushrooms (× 3)	1	Celery (1 stalk)	1
	Wine (1 glass)	1	Rice (1.5 cups)	1	Dressing (1 dessertspoon)	*
	Coffee and milk	*	Strawberries (× 8)	1	Pear × 1	1
		Yoghurt (tub)	*	Custard (⅔ cup)	*	
		Coffee and milk	*	Coffee and milk	*	
Snack	Orange × 1	1	Grapes (× 20)	1	Sweet biscuit	*
	Tea and milk	*	Tea and milk	*	Tea and milk	*
Totals		19		9		7

Food variety score in 3 days = 35

*Repeated food variety item: no score

Table II. Food variety check-list*

Grains and cereals

- Wheat (includes ready-to-eat cereals such as Weet-Bix, Bran Flakes, and wholemeal or white bread)
- Rye (includes ready-to-eat products)
- Barley (includes ready-to-eat products)
- Oats (includes ready-to-eat products)
- Rice (includes ready-to-eat products)
- Corn (includes ready-to-eat products)
- All other grains and cereals (e.g. buckwheat, millet, quinoa, sago, semolina, tapioca, triticale)

Fruit

- Stone fruit (e.g. apricot, avocado, cherries, nectarine, olive, peach, plum, prune)
- Citrus (orange, lemon)
- Apples
- Bananas
- Berries (e.g. raspberry, strawberry)
- Grapes (including raisin, sultana)
- Melons (e.g. honeydew, rock melon, watermelon)
- Pears, nashi
- Tropical fruit (e.g. guava, jackfruit, lychee, mango, papaya, pineapple, star fruit)
- Date, kiwi fruit, passionfruit

Vegetables

- Root (e.g. carrots, sweet potatoes, potatoes, bamboo shoots, beetroot, ginger, parsnip, radish, water chestnut)
- Leafy greens (e.g. spinach, cabbage, brussels sprouts, silverbeet)
- Marrow-like (e.g. cucumber, eggplant, marrow, pumpkin, squash, swede, turnip, zucchini)
- Flowers (e.g. broccoli, cauliflower, endive, chicory, lettuce)
- Stalks (e.g. celery)
- Onion (e.g. spring onion, garlic, leek)
- Peppers (e.g. capsicum)
- Tomatos, okra

Legumes/pulses

- Beans (e.g. green beans, snow peas, snap beans, peas/dried)
- Adzuki, baked beans, haricot, black beans, black-eye beans, borlotti beans, cannellini beans, chickpeas, kidney beans, lentils, lima beans, lupins, mung beans (sprouts), pinto beans, soya beans (sprouts), soya milk, bean curd

Nuts and seeds

- Almond, brazil nut, cashew nut, chestnut, coconut, hazelnut, peanuts, peanut butter, pecan nut, pine nut, pistachio nut, pumpkin seed, sesame seed, tahini, hommus, sunflower seed, walnut

Meats

- Pork (including ham and bacon)
- Lamb, beef, veal
- Poultry (e.g. chicken, turkey, duck)
- Game (e.g. quail, wild duck, pigeon)
- Game (e.g. kangaroo, rabbit)
- Liver, brain, all other organ meats

Seafood

- Shellfish and mollusc (e.g. mussels, squid, oysters, scallops)
- Crustaceans (e.g. prawns, lobster, crab, shrimps)
- Fatty fish (e.g. anchovies, tuna, salmon, sardines, herring, mackerel, kipper, pilchards)
- Fish (saltwater)
- Fish (freshwater)
- Roe (caviar)

Dairy

- Milk, yoghurt (without live culture), ice-cream, cheese
- Live cultures (yoghurt with live culture, e.g. acidophilus, bifidobacteria)

Eggs

- All varieties

Fats and Oils

- Oils
- Hard/soft spreads

Fermented foods

- Miso, tempeh, soya sauce
- Sauerkraut
- All other variety

Beverages

- Non-alcoholic (tea, coffee, cocoa)
- Alcoholic

Herbs and spices

- Use regularly

Yeast

- For example, Vegemite, Marmite, brewer's yeast

Fungi

- All varieties

Sugar/confectionary

- All varieties (including soft drinks)

Water

- Including mineral

*Score 1 point for each food category eaten from. The maximum score for this check list would be 57. Quantities smaller than 1-2 tablespoons (except for fats, oils and veg-emite) do not represent a sufficient quantity to rate a score (e.g. a slice of tomato in a hamburger)

Table III. Relationship between food variety score and dietary adequacy

Total food variety score	Dietary adequacy*
>30/week	Very good
25-29/week	Good
20-24/week	Fair
<20/week	Poor
<10/week	Very poor

*The concept of dietary adequacy embraces that of essential nutrient adequacy but also takes into account other food components and food properties. It can be noted that consumption of about 60% of available variety is very good, and about 40% fair, from health risk and outcome points of view

Additional Considerations

A number of groups in the community may be at risk of poor nutrition. These include the elderly, vegetarians, those with medical conditions such as coronary heart disease (CHD), and the obese.

A good food variety score should reduce the risk of nutritional deficiencies in elderly individuals, provided sufficient energy is consumed

The Elderly

As energy expenditure declines with age, less food may be consumed. While nutritional adequacy becomes more difficult to achieve if energy intakes are small, a good food variety score should reduce the risk of developing nutritional deficiencies in this group, provided sufficient energy is being consumed.

Vegetarians

Vegetarians who avoid all animal products should be aware that cereals and legumes or nuts and/or seeds should be consumed with each meal to ensure the plant protein they consume is of adequate quality. Iron is in the non-haem form in plant foods and is therefore not absorbed easily. Iron absorption can be improved by consuming a vitamin C-containing food with meals, for example, sliced tomato on toast, strawberries on Weet-Bix.

Coronary Heart Disease

A number of studies have examined the relationship between fish consumption and CHD. In individuals who consume a small amount of fish there is a protective effect in relation to CHD.

Obesity

Exchanging intake of high energy-dense foods with a variety of low energy-dense foods should assist in weight loss and/or control.

When assessing food intake, it is important to ask about appetite, meal patterns and dietary issues of specific relevance to health problems

Nutritional Assessment

Nutritional assessment should be carried out in the following stepwise manner.

1. Take a medical history to establish a health profile and priorities in the context of which nutritional decisions must be considered
2. Assess food intake to establish food patterns and identify any nutritionally-related health problems. The patient should be asked about:
 - Appetite and meal patterns
 - Specific issues relating to health problems, such as fat intake and obesity, cardiovascular diseases and diabetes: calcium intake and osteoporosis.

A food variety score should be calculated as a measure of dietary adequacy. Table III shows how food variety score can be related to overall dietary adequacy using a semi-quantitative approach, where the maximum score is about 50/week (see Table II)
3. Perform a physical examination, including anthropometry for body composition, height, weight, waist:hip ratio, and circumference and skinfold measures (calf and arm)
4. Choose investigations that will substantiate or confirm deductions made on the basis of the history (medical and food) and examination findings. In particular, they should clarify nutritional causality and pathogenesis and/or provide variables for monitoring progress. Examples include:
 - Haematological investigations – haemoglobin, red cell indices, lymphocyte count
 - Biochemical investigations – iron, ferritin, zinc, B12, folate
 - Immunological investigations – delayed hypersensitivity reaction, immunoglobulins
 - Physiological investigations – dark adaptation, muscle strength.



ABRIDGED PRODUCT INFORMATION

Please consult full Product Information before prescribing.

NAME MONOPRIL (fosinopril sodium); a long-acting angiotensin converting enzyme (ACE) inhibitor.

APPROVED INDICATION FOR USE Mild to moderate hypertension. **Heart failure when added to conventional therapy. Including diuretics. CONTRAINDICATIONS** Hypersensitivity to fosinopril sodium, or to any other ACE inhibitor. A history of hereditary and/or idiopathic angioedema or angioedema associated with previous treatment with an ACE inhibitor. **Pregnancy. CLINICALLY SIGNIFICANT WARNINGS: ANAPHYLACTOID AND POSSIBLY RELATED REACTIONS.** Angioedema: Severe life threatening angioedema has been reported with ACE inhibitors. In such cases the product should be promptly discontinued and the patient carefully observed until the condition resolves. Medical therapy of progressive angioedema should be aggressive. In the majority of reported cases the symptom occurred during the first week of therapy. Patients who respond to medical treatment should be observed carefully for a possible rebound phenomenon. Caution: in patients treated with ACE inhibitors undergoing desensitisation procedures. Patients haemodialysed or undergoing plasma apheresis using high-flux polyacrylonitrile ("AN69") membranes are highly likely to experience anaphylactoid reactions with ACE inhibitors. **NEUTROPENIA/AGRANULOCYTOSIS.** ACE inhibitors have been associated with agranulocytosis and bone marrow depression, particularly in patients with coexisting renal and/or collagen vascular disease. **Periodic monitoring of white blood cell counts should be considered in these patients and those on multiple drug therapy with agents known to be nephrotoxic or myelosuppressive.** **HYPOTENSION.** Fosinopril has been rarely associated with hypotension in uncomplicated hypertensive patients. In patients with congestive heart failure, ACE inhibitor therapy may cause excessive hypotension, this is most likely to occur in volume and/or salt-depleted patients, eg following prolonged diuretic therapy. **The risk of a hypotensive response can be minimised by discontinuing diuretic therapy (or reducing the dose) and/or ensuring adequate hydration and salt intake prior to initiating Monopril. If diuretics are continued, the patient should be closely observed for several hours following an initial dose and until blood pressure has stabilised. A transient hypotensive response is not a contraindication to further doses which may be given without difficulty after replacement of salt and/or volume.** **HEPATIC FAILURE.** Rarely, ACE inhibitors have been associated with a syndrome that starts with cholestatic jaundice and progresses to fulminant hepatic necrosis and (sometimes) death. **LACTATION. MONOPRIL should not be administered to breastfeeding mothers.** **CLINICALLY SIGNIFICANT PRECAUTIONS: HYPERKALAEMIA.** Hyperkalaemia is more likely in diabetics, and patients with renal impairment, or in patients receiving potassium-sparing diuretics or potassium supplements or consuming potassium containing salt substitutes. **IMPAIRED RENAL FUNCTION.** Treatment with ACE inhibitors may be associated with oliguria and/or progressive azotemia but rarely with acute renal failure and/or death. Deterioration in renal function in patients with renal artery stenosis is usually reversible on stopping ACE inhibitor and/or diuretic therapy. Renal function should be monitored during the first few weeks of ACE inhibitor therapy. Paradoxically ACE inhibitors have a real potential to delay progression of nephropathy in diabetic as well as in hypertensive patients. **In patients with congestive heart failure and pre-existing renal failure, fosinopril like other ACE inhibitors should be used with caution. Although available data suggests minimal accumulation during 10 days therapy with fosinopril 10mg daily, dosage reduction in this patient group may be necessary and renal function should be closely monitored.** **SURGERY/ANAESTHESIA.** **DERMATOLOGICAL REACTIONS. LABORATORY TEST ABNORMALITIES.** Hyperkalaemia, hyponatraemia, BUN and creatinine, transaminases, alkaline phosphatase and serum bilirubin. **HAEMATOLOGY.** In controlled trials, a mean haemoglobin decrease of 0.13 g/dL was observed in fosinopril-treated patients. **CLINICALLY SIGNIFICANT ADVERSE EFFECTS AND INTERACTIONS.** In placebo-controlled clinical trials in hypertension 3.3 percent of patients were discontinued from fosinopril and 1.2 percent from placebo due to any adverse experience. **In heart failure studies, the discontinuation rates due to any clinical or laboratory adverse event, except for heart failure, were 8.0% and 7.5% in MONOPRIL treated and placebo-treated patients respectively.** The incidence of adverse experiences in the elderly (>65 years old) was similar to that seen in younger patients. Clinical adverse events reported during clinical trials regardless of attribution were: **General:** fatigue, chest pain, edema, viral infection, weakness. **Cardiovascular:** rhythm disturbances/palpitations, hypotension, orthostatic hypotension, angina pectoris. **Dermatological:** rash. **Gastrointestinal:** nausea/vomiting, diarrhoea, abdominal pain, pyrosis. **Musculoskeletal/Connective Tissue:** musculoskeletal pain, myalgia. **Nervous System:** headache, dizziness, mood change, paresthesia, sleep disturbance. **Respiratory:** cough, rhinitis, pharyngitis. **Special Senses:** taste alterations, vision disturbances. **Urogenital:** abnormal urination, sexual dysfunction. **COUGH.** A persistent dry (non-productive) irritating cough has been reported with all ACE inhibitors in use. **INTERACTION WITH DIURETICS (see CLINICALLY SIGNIFICANT WARNINGS AND DOSAGE REGIMENS).** **LITHIUM.** Care should be exercised during the concomitant administration of ACE inhibitors, diuretics and lithium. **POTASSIUM SUPPLEMENTS AND SALT SUBSTITUTES (see CLINICALLY SIGNIFICANT PRECAUTIONS).** **ANTACIDS.** Antacids may impair absorption of fosinopril. Dosing should be separated by 2 hours. **PROSTAGLANDIN INHIBITORS.** Indomethacin has been reported to reduce the antihypertensive effects of other ACE inhibitors. **Other nonsteroidal anti-inflammatory agents may have similar effects. DICOU/MARFARIN.** In pharmacokinetic studies in healthy volunteers, no clinically significant interactions occurred when MONOPRIL was co-administered with either digoxin or warfarin. **AVAILABLE DOSAGE FORMS:** White tablets containing 10mg or 20mg fosinopril sodium in blister calendar packs of 30. **DOSEAGE REGIMENS: Hypertension: For Hypertensive Patients Not Being Treated With Diuretics:** The recommended initial dose of MONOPRIL is 10mg once a day. The usual dose range required to maintain blood pressure control is 10 to 40mg per day administered as a single dose. MONOPRIL should be taken at the same time each day. Dosage should then be adjusted according to blood pressure response. If blood pressure is not adequately controlled with MONOPRIL alone, a diuretic may be added. **For Hypertensive Patients Currently Being Treated With Diuretics (or who may be volume depleted):** The diuretic should preferably be discontinued for several days prior to beginning therapy with MONOPRIL in order to reduce the risk of an excessive hypotensive response. (See WARNINGS AND PRECAUTIONS). If blood pressure is inadequately controlled after an observation period of approximately 4 weeks, diuretic therapy may be resumed. Alternatively, if diuretic therapy cannot be discontinued, an initial dose of 10mg of MONOPRIL should be used with careful medical supervision for several hours and until blood pressure has stabilised. **Heart failure:** The recommended initial dose of MONOPRIL is 10mg once daily. Therapy should be initiated under close medical supervision. If the initial dose of MONOPRIL is well tolerated, the dose may be titrated at weekly intervals according to clinical response up to 40mg once daily. The appearance of hypotension after the initial dose should not preclude careful dose titration with MONOPRIL following effective management of hypotension. MONOPRIL should be used in conjunction with a diuretic (WARNINGS - Hypotension). **For patients with renal impairment:** In patients with impaired renal function, the total body clearance of fosinopril diacid is approximately 50% slower than in patients with normal renal function. However, within the population of renally impaired patients, the body clearance of fosinopril diacid does not differ appreciably with the degree of renal insufficiency, including end-stage renal failure (creatinine clearance <10mL/min/1.73m²), since diminished renal elimination is partially compensated by increased hepatobiliary elimination. The relatively greater clearance by the hepatobiliary route of active fosinopril diacid when compared with total clearance in patients with renal failure permits use of an initial dose of 5 to 10mg. **An initial dose of 5mg is preferred in heart failure patients with moderate to severe renal failure or those who have been vigorously diuresed. In patients with congestive heart failure and chronic renal failure, subsequent dosage adjustments should be made to control the patient's heart failure under careful clinical monitoring including frequent determination of renal function. For patients with hepatic insufficiency:** It is advisable to initiate treatment at a dose of 10mg in patients with mild to moderate impairment. Although the rate of hydrolysis of fosinopril diacid may be slowed, the extent of hydrolysis is not appreciably reduced in patients with hepatic impairment. In this group of patients, there is evidence of reduced hepatic clearance of fosinopril diacid with compensatory increase in renal excretion. **Use in the elderly (over 65 years)** No dosage reduction is necessary in patients with clinically normal renal and hepatic function. **USE IN PREGNANCY:** Category D. MONOPRIL is contraindicated in pregnancy.

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