

Dietotherapy

THE SODIUM-RESTRICTED DIET

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A RECENT publication prepared by a committee of the Food and Nutrition Board¹ presents a comprehensive report of the uses, planning, and administration of sodium-restricted diets. Such diets may be useful when they are planned to provide a sodium intake at a level adjusted to the individual's requirements and to include the essentials of normal nutrition.

NOMENCLATURE FOR SODIUM-RESTRICTED DIETS

Terms such as "salt-free," "low-salt," and "salt-poor" refer simply to the exclusion of table salt and perhaps to the salt used in cookery, and do not recognize the many sodium products other than sodium chloride which may be present in foods, either naturally or as a result of processing. Therefore, diets should be designated as "sodium-restricted."

Some conditions require a severe restriction of sodium to approximately 250 mg, while for other conditions sodium levels of 500 mg or 800 mg may prove to be satisfactory. Only by specifically designating a level of sodium in milligrams per day can the physician be assured that a satisfactory diet plan will be worked out by the dietitian or nutritionist. It should be clearly understood, however, that the data on the sodium content of foods are by no means as complete as might be desired, and that values for a given food may vary quite widely from those in published tables. Hence, a specific designation, such as 500 mg sodium diet, establishes a range for planning

the diet but does not denote a quantitatively exact amount.

SODIUM CONTENT OF FOODS

The usual daily intake of sodium is about 3 to 6 g. When the diet is prepared without salt, the sodium level may be reduced to approximately 1000 to 1500 mg, depending upon the choice of foods, the amounts of animal foods used, and the amounts of salted bread and butter included.

In general, animal foods contain relatively important amounts of sodium. Therefore, milk, eggs, meat, poultry, and fish must be used in measured amounts. Organ meats and shellfish contain somewhat greater amounts of sodium, dark meat of poultry appears to be of higher sodium value than light meat, and egg white is considerably higher in its concentration of sodium than is egg yolk.

Fruits, cereals, and most vegetables are insignificant sources of sodium and may be used without restriction in the diet. Certain vegetables such as spinach, beet greens, celery, and a few others noted in the lists below should be omitted from the diet when sodium restriction is severe because their use would necessitate the exclusion of more important protein foods. The water supply¹ in certain communities may contribute significant amounts of sodium.

Table salt is the principal source of dietary sodium. It is used not only in the home preparation of foods but finds its way into many manufactured food products for flavor, as a preservative, as a means to separate peas or lima beans for quality before canning and freezing, and in a rinse to prevent the discoloration of fruits.

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TABLE I
Nutritive Value for a Basic Pattern for the Sodium-Restricted Diet¹

Food	Household Measures	Weight g	Energy cal	Protein g	Fat g	Carbo- hydrate g	Minerals		A IU	Vitamins		Ascorbic acid mg		
							Na ² mg	Ca mg		Thia- mine mg	Ribo- flavin mg		Niacin mg	
Milk	2 cups	488	335	17	19	24	244	576	0.4	780	0.18	0.84	0.6	6
Egg	1 medium	54	75	6	6	0	70	26	1.3	550	0.05	0.14	Tr.	0
Meat, poultry, or fish	5 ounces (raw weight) (cooked)	120	365	28	27	0	104	10	3.5	2280 ³	0.30	0.40	6.9	0
Whole-grain or enriched cereal ⁴	1/2 cup (dry)	30	110	3	Tr.	24	Tr.	12	0.9	0	0.16	0.05	1.0	0
Whole-grain or enriched bread	4 slices	100	275	9	3	52	30	79	1.8	0	0.24	0.15	2.2	0
Potato	1 medium	150	125	3	Tr.	29	4	17	1.0	30	0.14	0.05	1.5	21
Leafy, green or yellow vegetable ⁵	1-2 servings	150	45	3	Tr.	9	14	67	1.5	1320	0.12	0.11	1.0	39
Other vegetables ⁶	1 serving	100	35	1	Tr.	8	4	19	0.6	770	0.06	0.06	0.7	17
Citrus fruit	1 serving	100	45	1	Tr.	12	1	27	0.4	120	0.07	0.03	0.2	47
Other fruit ⁷	2 servings	200	125	1	1	32	5	24	1.0	1200	0.08	0.08	0.8	18
Butter or fortified margarine	2 tablespoons	30	215	—	24	Tr.	3	Tr.	0	990	Tr.	0	Tr.	0
Recommended Dietary Allowances			1750	72	80	190	479	857	12.4	8040	1.40	1.91	14.9	148
Woman (45 years)			2100	55	..	..	..	800	12	5000	1.0	1.4	10	70
Man (45 years)			2900	65	..	..	..	800	12	5000	1.4	1.6	14	75

¹ Average values for each food group have been computed according to the percentage distribution of food supplies as described in *Planning Food for Institutions*, Agriculture Handbook No. 16, U. S. Department of Agriculture, 1951.

Food values used are those published in *Composition of Foods—Raw, Processed, Prepared*, by B. K. Watt and A. L. Merrill, Agriculture Handbook No. 8, Bureau of Human Nutrition and Home Economics, Washington, 1950.

Calories and vitamin A have been rounded off to the nearest 5 and protein, fat, and carbohydrate to the nearest whole gram.

² Values for sodium are those naturally occurring in food before any additions have been made through processing and cookery. The values used are those from table 2 in *Sodium-Restricted Diets*, Publication No. 325, by a committee of the Food and Nutrition Board, National Research Council, Washington, D. C., 1954.

³ The vitamin A value is reduced to 0 if an average of 1 ounce of liver per week is omitted.

⁴ Includes farina, rolled oats, rolled wheat cereal, wheat meal, shredded wheat, puffed wheat, puffed rice. Some quick-cooking cereals to which disodium phosphate has been added and other dry cereals with added salt are omitted.

⁵ Includes asparagus, broccoli, Brussels sprouts, cabbage, escarole, lettuce, lima beans (not frozen), okra, peas (not frozen), peppers, pumpkin, snap beans, winter squash, turnip greens. Excludes beet greens, carrots, chard, kale, spinach.

⁶ Includes cauliflower, corn, cucumber, eggplant, onion, parsnip, radishes, summer squash, rutabagas, tomatoes. Excludes beets, celery, white turnips.

⁷ Includes all fruits other than citrus—fresh, canned, or frozen.

Baking powder, baking soda, sodium acetate, sodium benzoate, sodium propionate, sodium alginate, sodium citrate, monosodium glutamate, and many other sodium compounds are used in food manufacture and home preparation so that it is essential that label information be noted before a processed food is used for a diet. The Food and Drug Administration now requires that foods intended for use in sodium-restricted diets must be labeled to indicate the number of milligrams of sodium in 100 g of the food and in an average serving of the food.²

Dietary restriction of sodium may be of no avail if sodium-containing barbiturates, sulfonamides, antibiotics, and salicylates are used. Patients need especially to be warned about the use of sodium-containing antacids or of sodium bicarbonate or salt used as a gargle or a dentrifice. A 2 g dose of sodium bicarbonate will contribute 547 mg of sodium.

NUTRITIVE ADEQUACY OF SODIUM-RESTRICTED DIETS

Many sodium-restricted diets have, in the past, provided inadequate levels of calcium, riboflavin, and protein because of the omission of milk. Likewise, the exclusion of meat and eggs has tended to jeopardize satisfactory protein, iron, and vitamin B complex nutrition. The injudicious inclusion of certain vegetables and some sodium-containing processed foods in diets at the expense of essential protein, mineral, and vitamin-rich foods is scarcely warranted.

Sodium levels of 500 mg or more per day may permit completely adequate allowances of all nutrients for the man or woman, as will be noted in the calculations for a basic plan in Table I. When sodium levels of 250 mg or less are indicated, the use of sodium-deficient milk in place of regular milk still insures a nutritionally adequate diet. Sodium-deficient milk powder has been available for a number of years, but more recently a liquid sodium-deficient milk has become available from dairies in metropolitan areas; the latter is a product of excellent flavor practically indistinguishable from that of fresh milk.

The caloric level of the basic list of foods is sufficient for many afebrile sedentary patients, but the caloric intake may be increased or decreased by using more or less of low-sodium cereals and breads, fats, and potatoes. Fruits, sugars, and jellies may be used as desired when there is no caloric restriction.

A MEAL PLAN FOR THE DAILY DIET

The basic list of foods should be adjusted to the meal patterns of the individual patient. One such meal pattern is given here.

Suggested Meal Pattern *Sample Menu*

All foods prepared and served without salt

Breakfast

Fruit, citrus—1 serving	Orange juice
Whole-grain or enriched cereal—1 serving	Shredded wheat
Milk for cereal and to drink—8 ounces	Milk—1 cup
Egg—1	Soft cooked egg—1
Unsalted bread—1 slice	Unsalted toast
Unsalted butter—2 teaspoons	Unsalted butter
Coffee or tea	Coffee
	Sugar, if desired
	Jelly, if desired

Luncheon or Supper

Lean meat, poultry, or fish—2 ounces	Ground beef, rice, and tomato casserole
Potato or substitute	
Vegetable, green or yellow, raw or cooked—1 serving	Mixed green salad—lettuce, endive, cauliflower, green pepper, radish
	Unsalted French dressing
Unsalted bread—1 slice	Orange biscuits*
Unsalted butter—2 teaspoons	Unsalted butter; jelly
Fruit—1 serving	Strawberries
Milk—8 ounces	Milk—1 cup

* Biscuits are leavened with sodium-free baking powder; orange juice is used as the liquid.

Dinner

Lean meat, fish, or poultry—2 ounces	Roast turkey—small serving
	Cranberry jelly
Potato or substitute	Mashed potato
Vegetable—1 serving	Buttered asparagus
Unsalted bread—1 slice	Unsalted roll
Unsalted butter—2 teaspoons	Unsalted butter

Fruit or dessert	Stewed apricots	<i>Foods from Which to Choose</i>	<i>Foods to Avoid</i>
Coffee or tea	Tea with sugar, lemon		
<i>Foods from Which to Choose</i>	<i>Foods to Avoid</i>	<i>Fruits</i>	
<i>Beverages</i>		Use without restriction except as noted	Those containing sodium benzoate as preservative
Carbonated	Dutch process cocoa		<i>Note:</i> Apples, melons, and berries are avoided if there is a tendency to distention
Cocoa	Milk drinks except as specified on diet		
Coffee		<i>Meat, poultry, fish</i>	
Fruit juices		Fresh or frozen beef, lamb, pork, veal, or rabbit	Brains or kidneys
Tea		Fresh or frozen chicken, duck, quail, turkey—especially white meat	Canned, salted, or smoked meats or fish: bacon, chipped beef, frankfurters, ham, herring, luncheon meats, salt pork, sausage
<i>Breads and crackers</i>		Liver—small serving once every 2 weeks	Shellfish: clams, crabs, lobster, oysters, shrimp
Passover matzoth	Commercial bread, biscuit, pancake, or waffle mixes	Fresh cod, bass, halibut, flounder, salmon	Frozen fillets or steaks of fish
Quick breads made with low-sodium baking powder or potassium bicarbonate	Salted breads	Canned unsalted (dietetic) salmon or tuna	
Unsalted bread	Self-rising flours	Canned dietetic pack meats	
Yeast rolls, waffles, gridle cakes	Pretzels		
	White and graham crackers	<i>Milk</i>	
<i>Cereals</i>		Only in specified amounts	
Cooked, unsalted farina, wheat meal, rolled oats, rolled wheat	All dry cereals except those listed as allowed	<i>Nuts</i>	
Puffed rice	Quick-cooking cereals which contain disodium phosphate	Unsalted	Salted; peanut butter
Puffed wheat		<i>Soups</i>	
Shredded wheat; muffets		Unsalted broth or using allowed milk and vegetables	All canned
Macaroni, rice, spaghetti			Salted broth and cream soups
<i>Cheese</i>	All except as noted	<i>Sweets</i>	
Washed cottage		Jams and jellies	Jellies containing sodium benzoate
Sodium-deficient Cheddar (dietetic)		Sugar and candies (note label information—some contain salt)	Candies to which salt or other sodium compounds have been added
<i>Desserts</i>			
Custard, ice cream (homemade), and puddings using part of milk and egg allowance	Cakes, and cookies with regular baking powder or baking soda	<i>Vegetables</i>	
Fruit tapioca pudding	Commercial cake, cookie, sweetened gelatin, ice cream, and pudding mixes	Fresh, frozen, or canned without salt:	Canned unless canned without salt:
Fruit pies with unsalted crust	Commercial ice cream	Asparagus	Beets
Gelatin desserts with plain gelatin and fruit juice		Broccoli	Beet greens
Cakes and cookies using sodium-free baking powder; salt omitted		Brussels sprouts	Carrots
		Cabbage	Celery
<i>Egg</i>		Cauliflower	Dandelion
Only 1 permitted		Cucumber	Kale
<i>Fats</i>		Corn	Mustard greens
Unsalted butter or margarine	Bacon fat	Eggplant	Spinach
Vegetable shortening and oil	Commercial salad dressings	Endive	Swiss chard
Lard	Cream except as part of milk allowance	Lettuce	Sauerkraut
Unsalted salad dressings	Salted butter or margarine	Lima beans (not frozen)	White turnips
			Potato chips

Foods from Which to Choose

Okra
Onions
Parsnips
Peas (not frozen)
Peppers
Sweet potato
White potato
Pumpkin
Radishes
Rutabagas
String beans
Squash of all kinds
Tomatoes
Turnip tops

Foods to Avoid

Note: When there is distention, avoid dried beans, legumes, broccoli, Brussels sprouts, cabbage, cauliflower, cucumber, onion, green pepper, radish, rutabaga, turnips

Seasonings

Extracts: almond, lemon, maple, orange, peppermint, vanilla, walnut
Herbs: basil, bay leaf, chives, dill, marjoram, mint, oregano, parsley, rosemary, sage, savory, thyme
Spices: allspice, cinnamon, cloves, curry, ginger, nutmeg, paprika, pepper, dry mustard
Meat flavorings such as Kitchen Bouquet, A-1 sauce, Worcestershire sauce, soy sauce, tabasco sauce
Prepared mustard and horseradish
Vegetable salts: celery, onion, garlic, bouillon cubes
Gravy
Catsup, chili sauce, olives, pickles, relishes

PREPARATION OF FOOD

The success of the sodium-restricted diet is determined by the patient's acceptance of the planned meals. Most spices, herbs, and other flavorings are low in sodium and may be used to provide variety in flavor. Many recipes can be used when the salt is omitted and when sodium-free leavening agents are used. It is necessary to use $1\frac{1}{2}$ teaspoons of sodium-free baking powder for each teaspoon of regular baking powder specified in a recipe. Sodium-free baking powder may be purchased or may be mixed in any drugstore according to the following formula:³

Potassium bicarbonate	39.8 g
Cornstarch	28 g
Tartaric acid	7.5 g
Potassium bitartrate	56.1 g

Potassium bicarbonate may be substituted for equal amounts of baking soda in any recipe.

Yeast-leavened breads, rolls, doughnuts, and waffles provide interesting variety.

Milk and eggs used in a recipe must be subtracted from the dietary allowance. It is also possible to substitute water for milk in most recipes by using 1 cup of water less 1 tablespoon for each cup of milk. Unsalted butter or vegetable fats are used in place of salted fats.

Raw fruits and vegetables should be given a prominent place in the diet since they contribute so much in flavor without the necessity for salt. Cooked fruits may be used in unsalted pastries.

A number of salt substitutes are available and have been accepted by many patients. They should not be used indiscriminately, and may be contraindicated altogether for patients with renal disturbances.

VARIATIONS OF THE SODIUM-RESTRICTED DIET

By referring to the basic diet calculations in Table I it will be observed that the following modifications can be made without difficulty:

250 mg sodium: substitute 2 cups of sodium-deficient milk for 2 cups of regular milk

250 mg sodium, 100 g protein: omit regular milk and egg; substitute 4 cups of sodium-deficient milk; add 4 ounces of meat

800 mg sodium, with added protein and calcium, as for children and in pregnancy: add 2 cups of regular milk

1200-1300 mg sodium: substitute 3 level teaspoons of salted butter (145 mg sodium) and 4 thin slices of salted bread (about 600 mg sodium) for unsalted bread and butter in basic pattern. Commercial bread and butter vary considerably in sodium content.

REFERENCES

1. COMMITTEE OF THE FOOD AND NUTRITION BOARD: *Sodium-Restricted Diets*, Publication 325, National Academy of Sciences—National Research Council, Washington, D. C., 1954.
2. *Federal Register*, July 1, 1954; 19 F. R. 3999.
3. *Planning Low Sodium Meals*, Newton Health Department, Newton, Mass., 1951.