SOURCES OF DIETARY SODIUM

Compiled By
Jerry Rivers, PhD Professor
Human Nutrition and Food
New York State College of Human Ecology
Cornell University, Ithaca, N. Y.

SODIUM IN NATURE

The sodium ion, being the sixth most abundant metallic ion in the earth's crust, is a natural constituent of both food and water.

In nature we find sodium in water from several sources. These are:

- Underground sodium salt deposits which are dissolved by water
- Sea water
- Natural ion exchange in soils where calcium ions in the water are replaced with sodium ions.

Sodium occurs naturally in foods because plants take up sodium from the soil water, and animals ingest plants and water containing sodium.

SODIUM ADDED BY MAN . . TO WATER

Man adds sodium to food and water in various ways. Sodium is added to water during the following processes:

- Water purification and bacterial control in water supplies are accomplished by adding sodium hypochlorite.
- The lime-soda method of softening water in municipal water treatment plants requires the addition of sodium compounds such as sodium carbonate.
- Home water softeners exchange calcium ions for sodium ions by using cation exchange resins.

. . TO FOOD

Man adds sodium to food for a variety of reasons. Sodium compounds are added to improve the flavor of many foods. For example:

Sodium chloride (salt) and monosodium glutamate (MSG, Accent, etc.) are used by commercial food processors in bacon, salted crackers, olives, soups, sauces, and almost all convenience foods such as frozen dinners and packaged mixes. These two products are also added by the homemaker in home food preparation.

Sodium compounds are also used to improve the texture of some foods.

Sodium bicarbonate in baking soda and baking powder makes baked goods rise.

Sodium alginate is used in chocolate milk and ice creams to improve their texture.

Sodium hydroxide is used to soften the skins of olives, certain fruits and grains.

Sodium compounds are used to preserve some foods. Sodium benzoate is used in jellies, relishes, and salad dressings.

Sodium propionate is used to inhibit mold growth in cheeses and bread.

. . TO MEDICATION

Sodium compounds are also used in many common medications such as:

Baking soda (home remedy for indigestion), and sodium compounds are used in many alkalizers and antiacids as well as many headache remedies, sedatives, and cathartics.

NORMAL SODIUM CONSUMPTION

It is estimated that the average person consumes the equivalent of 2 to 3 teaspoons of salt per day from all sources. This is about 8 to 15 grams. Some of this salt is in the food naturally, but most of it is added in processing, preservation, cooking, and at the table. A salt (sodium chloride) intake of 8 to 15 grams is equal to about 3 to 6 grams (3,000 to 6,000 milligrams) of sodium.

An example of this daily intake might be as follows:

FOOD	APPROXIMATE SODIUM CONTENT IN MILLIGRAMS
Breakfast	
½ cup canned tomato juice	270
1 egg (no salt added)	60
2 slices bacon	150
2 biscuits or toast	300
2 teaspoons margarine	100
Lunch	
Luncheon meat, corned beef or ham (3 oz.)	900
Processed cheddar cheese (1 oz.)	420
2 slices white bread	300
1 cup milk	120
1 large olive	130
1 dill pickle	930
1 teaspoon mustard	60
Potato chips, about 10	200
Dinner	
Steak, 6 oz., no salt added	80
Green salad with 1 ounce French Dressing	450
Baked potato, salt added	240
Two pats margarine	100
Bread, 2 slices or equivalent	300
TOTAL SODIUM ..... (milligrams)	5,110

SODIUM IN SOFTENED WATER

Since sodium is added to water softened by the cation exchange process (mechanical water softening), the level of sodium in softened water may be of interest to persons on sodium restricted diets.

Table 1 shows the amount of sodium added to softened water of varying original hardness. The harder the water originally, the more sodium that is added.

TABLE 1 – Sodium Added to Water from Cation Exchange Softening

Initial Water Hardness	Sodium added by Cation Exchange Softening of Water	
Grains per Gallon	Milligrams Na+/gal.	Milligrams Na+/qt.
1	30	7.5
5	149	37
6	179	44
7	209	52
8	239	60
9	269	68
10	298	75
15	447	112
20	596	150
30	894	225
40	1,191	300

CONTRIBUTION OF SODIUM FROM WATER SOFTENING TO TOTAL SODIUM INTAKE

Assuming a daily intake of 5 grams (5,000 milligrams) of sodium in food and the consumption of 3 quarts of water (used for coffee, tea, food preparation, and drinking) the contribution of the sodium (Na+) in the water from the home water softening process compared to the total daily intake can be seen in the following table.

TABLE 2 – Sodium Intake from Softened Water Compared to Total Sodium Intake

Initial Water Hardness/ Grains per Gallons	Milligrams Na+ Per 3 qts. Softened Water	Milligrams Na+ from Food	Total Na+ Consumed Milligrams	% of Total from Softened Water
1	23	5,000	5,023	0.4%
5	112	5,000	5,112	2.2%
10	223	5,000	5,223	4.3%
15	335	5,000	5,335	6.5%
20	447	5,000	5,447	8.2%
30	670	5,000	5,670	12.5%
40	893	5,000	5,893	15.2%

SODIUM-RESTRICTED DIETS

Persons who must restrict their sodium intake to 500 milligrams per day should consume water that contains no more than 20 milligrams of sodium per quart. This is assuming that most people consume about three quarts of water per day from all sources (beverages, food preparation, and drinking). *Twenty* milligrams per quart X *Three* quarts equals *Sixty* milligrams total daily from water.

The 60 milligram level has been suggested since the basic 500 milligram therapeutic diet actually contains about 440 milligrams of sodium from food. This allows 60 milligrams of sodium from water.

If sodium (Na+) is restricted to 1000 milligrams per day, the upper limit for total sodium content of water is about 200 milligrams or about 66 milligrams per quart if three quarts are consumed.

See Table 3 for original hardness limits of softened water for different levels of water consumption.

TABLE 3 – Original Hardness Limits of Softened Water Allowable for Sodium Restricted Therapy

Total Sodium Level Permitted	Total Sodium Allowed from Water	Original Hardness Limits in Grains per Gallon (gpg) if Consumption of Softened Water is:		
		3 Qts.	2 Qts.	1 Qt.
500 mg.	60 mg.	2.6 gpg	4 gpg	8 gpg
1000 mg.	200 mg.	8.8 gpg	13 gpg	26 gpg

If an ion exchange water softener is to be used in a home where a person is on sodium-restricted therapy and water hardness is great enough that excess sodium may be consumed by using softened water, a by-pass can be installed to provide unsoftened water for drinking and cooking.

In some localities the sodium content of the municipal water supply and water from wells may also be higher in sodium than can be allowed.

Persons on sodium-restricted therapy can obtain advice from a physician or dietician. The municipal water department will provide a detailed analysis of the water supply. Detailed analysis of well-water can also be obtained. Contact the municipal water department, the Public Health Service, a local water softening dealer, or the Cooperative Extension Service for the name and address of a laboratory which makes this analysis.