

Warning Labels for Potassium-Enriched Low-Sodium Salts

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I. Brief overview of low-sodium salts

Low-sodium salts, in which the sodium chloride in regular salt is partially replaced with potassium chloride, lower the sodium content while maintaining the taste and function of salt in foods. The joint actions of reducing dietary sodium and increasing potassium intake lower systolic and diastolic blood pressure.¹ Use of low-sodium salts is thus a promising public health strategy to prevent the adverse consequences of high blood pressure. In a recent pragmatic large-scale trial conducted over 5 years in 600 villages in rural China, replacing regular salt used for home cooking with low-sodium salt reduced the risk of stroke by 14% and death by 12%.^{*} Low-sodium salt can be used in place of regular salt during home cooking, at the dining table, in foods consumed outside the home (such as foods eaten at restaurants, street vendors or cafeterias) or in manufactured foods. There is empiric evidence that low-sodium salts are well accepted when they contain no more than 30% potassium chloride.

II. Potential risks of low-sodium salts

Potassium is a mineral essential for health and high dietary potassium intake is generally recommended considered safe for healthy adults and children. However, there are concerns with use of low-sodium salts that contain potassium for certain populations due to the potential for adverse effects from hyperkalemia, specifically the increased risk of arrhythmias and sudden cardiac death. Individuals identified to be most vulnerable to hyperkalemia include persons with advanced chronic kidney disease, diabetes, severe heart failure, those using medications that impair potassium excretion, older adults and individuals with adrenal insufficiency.² However, the risk of hyperkalemia due to high dietary potassium intake (including from low-sodium salt use) among individuals with medical conditions or who take medications that impair their potassium excretion has not been well explored.

In studies evaluating the effect of low-sodium salts, there were no reports of excess risk of adverse events, including severe hyperkalemia, even in pragmatic large-scale trials (including the recent study from China) with limited attempts to exclude individuals with risk factors of hyperkalemia (e.g., decreased kidney function, using medications that impair potassium excretion, or elevated potassium levels).^{3,5 *} Furthermore, a study evaluating the safety of low-sodium salts (25% or 35% potassium chloride) among elderly hospitalized patients (many on diuretics) or drug-treated outpatients with hypertension (about half on potassium-sparing medication), reported no adverse effects from use of low-sodium salts.⁶

III. Food sources of potassium and dietary recommendations

High potassium intake is often associated with a generally healthy diet and foods rich in potassium, such as fruits and vegetables, meat, poultry, and fish.⁷ For example, an avocado contains about 975 mg potassium, a chicken leg 698 mg, and a medium boiled potato 632 mg.⁸ Food additives, preservatives, and certain low sodium salts also contribute to potassium intake (e.g., potassium preservatives in prepared meat may add 300-575 mg of potassium per 100 g of meat intake).⁷

In a recent meta-analysis of 10 salt substitute trials, replacing regular salt with salt substitutes increased potassium excretion on average by 447 mg per day.¹ Assuming that about three quarters of dietary potassium is excreted in urine,⁹ this corresponds to an increased potassium intake of 580 mg per day from salt substitutes. In a large randomized clinical trial currently conducted in 600 villages in Northern China, replacement of regular salt with potassium-enriched low-sodium salts (average 25% potassium chloride) was estimated to increase daily potassium intake by 860 mg per day on average.¹⁰

For the general adult population, the World Health Organization recommends a daily potassium intake of at least 3510 mg per day to prevent hypertension and related diseases.¹¹ In order to prevent hyperkalemia among patients with advanced CKD, opinion-based guidelines recommend a low-potassium diet.⁷ However, evidence from observational studies suggests weak associations between dietary potassium intake and serum potassium concentration in this patient group, and thus challenges the belief that the amount of potassium consumed strongly influences potassium concentration.⁷ While increased potassium intake theoretically can elevate the risk of hyperkalemia, it may also benefit patients with CKD by reducing blood pressure¹² and may slow CKD progression.¹³ In a recent modelling study, we estimated that replacing regular salt with salt substitutes in China would be net lifesaving among individuals with CKD.¹⁰ However, more research is needed to assess how replacement of regular salt with potassium-enriched low-sodium salts impacts blood pressure and serum potassium levels or hyperkalemia risk in high-risk individuals (e.g., CKD patients).

IV. Landscape of health warnings for low sodium salts

Outside China, there are no mandatory regulations to label foods rich in potassium as a strategy to prevent hyperkalemia in high-risk populations. However, some manufacturers of potassium-enriched low-sodium salts voluntarily include a health warning or advice on their packages to inform individuals at risk for hyperkalemia to seek medical advice before use or to completely avoid the product.

A comprehensive literature and online search regarding low-sodium salt availability around the world was conducted from October 2019 to September 2020.¹³ Of a total of 87 unique low-sodium salts identified in 47 countries (n=28 high-income countries, n=19 middle-income countries), 43 products displayed some kind of health warning. There was no standardization across health warnings and there was considerable variation in target populations and recommendations. The most frequently targeted populations included individuals on low-potassium diets (70%), those with kidney disease (65%), or those using anti-hypertensive drugs (48%). Most health warnings recommended consultation with health care professionals before use (55%), or to use the product with caution (40%; e.g., Chinese low-sodium salts displayed a recommendation that people

advised to limit their potassium intake should use the product with caution*), while a few advised avoidance for high-risk individuals (n=2). Warnings were more common on sodium-free salts (5 of 7) compared to low-sodium salts (49%).

V. Recommendations

Given the potential risks of hyperkalemia, warning labels on potassium-enriched low-sodium salt are warranted. The warning label should inform consumers of possible contraindications to low-sodium salt use that may increase their risk for hyperkalemia while not unnecessarily discouraging consumers who would benefit from the product. For potassium-enriched low-sodium salts the warning label should: 1) raise consumers' awareness that the product contains potassium and 2) inform individuals who have been specifically instructed to limit their dietary potassium intake to consult their healthcare provider prior to use since they are at highest risk for adverse outcomes (e.g., individuals with advanced kidney disease and elevated serum potassium or those initiating potassium-sparing diuretics).

EXAMPLE LABEL CONTENT:

- This product contains potassium. If you have been told to limit potassium in your diet, please consult your doctor or other health care professional before use.

Additional variations:

- This product contains potassium. Consult your doctor or other health care professional before use if you have been told to limit potassium in your diet.
- This product contains potassium. If you have been told to eat a low-potassium diet, please consult your doctor or other health care professional before use

The recommendations regarding inclusion of other conditions considered high risk for hyperkalemia on the warning label are less clear. Due to the benefits of eating a healthy potassium-rich diet, individuals with risk factors for hyperkalemia (e.g., persons with kidney disease, diabetes, heart failure, older adults, or taking certain medication such as ACE inhibitors or angiotensin receptor blockers) are generally not instructed by their health care providers to limit their dietary potassium intake unless they have a prior personal history or tendency towards hyperkalemia. General clinical guidance recommends that patients with health conditions such as kidney disease or on certain medications that may impair potassium excretion (e.g., ACE inhibitors or angiotensin receptor blockers) be monitored for hyperkalemia periodically. However, these recommendations, commonly part of clinical guidelines, are very inconsistent. Additionally, trials of low sodium salts rarely excluded this population and has not shown major adverse effects. While low-sodium salt use should not necessarily be discouraged in this population, a warning label referring consumers with potential risk factors to notify their health care providers' may help to mitigate potential risks of hyperkalemia through patient education about appropriate use of low-sodium salts or potential adjustment

* Text on warning label: 高温作业者、重体力劳动强度工作者、肾功能障碍及服用降压药的高血压患者等不适宜高钾摄入的人群应慎用。 Eng. "It should be used with caution among people for whom high potassium intakes are not appropriate, such as high-temperature workers, heavy-labour workers, renal dysfunction and hypertension patients taking antihypertensive drugs."

in the frequency of monitoring for hyperkalemia based on an individuals' baseline risk of hyperkalemia. Additionally, educational initiatives targeting health care professionals' regarding the appropriate and safe use of low-sodium salts may also help to minimize use among individuals at high risk for hyperkalemia.

EXAMPLE LABEL CONTENT:

- This product contains potassium. Persons with diabetes, kidney or heart disease should consult their doctor or other health care professional before using.

In addition to the warning label, the amount of potassium the low-sodium salt contains should be clearly listed on the nutrition facts for the product. The risk of hyperkalemia may vary between different low-sodium salt products, with products containing higher amounts of potassium posing greater potential risks of hyperkalemia. For example, 1 g of NuSalt contains 530 mg of potassium and the same amount (1 g) of Tata Salt Lite™ contains approximately 78 mg of potassium.

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