Hypertension in the US: Today’s public health challenge

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“You’ve got the blood pressure of a teenager – who lives on junk food, TV and the computer.”
Prevalence of CHD Associated with Three Projections of Future Adult Obesity (based on current adolescent overweight)

Bibbins-Domingo K et al. N Engl J Med 2007;357:2371-2379
Awareness, treatment, and control of hypertension by age in US, 1999-2000

Summary

• Increasing prevalence of hypertension in US.

• More poorly controlled hypertension.

• Worsening trends in younger adults.
HERE, TIMMY... YOU CAN WASH DOWN YOUR BLOOD PRESSURE MEDICATION WITH THIS CHOCOLATE SHAKE...
Modern Western Diet

High sodium intake
- Lack of renal adaptation and other defects in sodium excretion
  - Retention of sodium by the kidneys
  - Excess of sodium in the body
    - Extracellular fluid volume expansion
      - Excess of cellular sodium
          - Release of digitalis-like factor
              - Na⁺/K⁺-TPase
                  - Vascular smooth-muscle cell contraction
                      - Deficit of cellular potassium
                          - Hypertension
                          - Increased peripheral vascular resistance

Low potassium intake
- Ineffective potassium conservation
  - Excessive renal and fecal potassium loss
    - Deficit of potassium in the body

Salt intake in the United States

- Recommended daily salt intake:
  - < 5.8gm/day (<2300 mg of sodium)
    - 1 gm salt = approx 400 mg sodium
  - < 3.8 gm/day (<1500 mg) FOR MOST ADULTS
    - (66% - those under 18, over 40, those with hypertension, and African Americans)

- Current daily intake in US:
  - 9.4 gm/day (3700 mg sodium)
  - Increased by 50% over the last three decades
Average daily salt intake in male and female Americans, as ascertained from 24-hour dietary recall, 2005-2006

Where is the salt?

80% in processed or pre-prepared foods

Sources: Mattes et al.
# Table 1a. Mean Intake of Sodium, Mean Intake of Energy, and Percentage Sodium Contribution of Various Foods Among US Population, by Age, NHANES 2005–06

<table>
<thead>
<tr>
<th>Rank*</th>
<th>Food Group*</th>
<th>All Persons</th>
<th>2-18</th>
<th>2-3</th>
<th>4-8</th>
<th>9-13</th>
<th>14-18</th>
<th>19+</th>
<th>31-50</th>
<th>51-70</th>
<th>71+</th>
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<td>7.2</td>
<td>6.1</td>
<td>7.4</td>
<td>6.8</td>
<td>7.5</td>
<td>7.3</td>
<td>5.9</td>
<td>6.5</td>
<td>8.8</td>
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<tr>
<td>2</td>
<td>Chicken and chicken mixed dishes</td>
<td>6.8</td>
<td>7.4</td>
<td>5.1</td>
<td>6.8</td>
<td>7.3</td>
<td>8.3</td>
<td>6.6</td>
<td>7.6</td>
<td>7.1</td>
<td>5.5</td>
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<td>3</td>
<td>Pizza</td>
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<td>9.4</td>
<td>4.7</td>
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<td>8.7</td>
<td>12.1</td>
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<td>7.5</td>
<td>6.4</td>
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<td>4</td>
<td>Pasta and pasta dishes</td>
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<td>0.3</td>
<td>7.0</td>
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<td>5.1</td>
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<tr>
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<td>1.6</td>
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<td>1.8</td>
<td>1.9</td>
<td>2.4</td>
<td>2.7</td>
<td>2.4</td>
<td>2.7</td>
<td>3.0</td>
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</tbody>
</table>
Sources of salt in our grocery bags

- 35% from cereal & cereal products
  - breads, cereals, pastries
- 26% from meat & meat products
- 8% from milk & milk products
  - milk, cheese

Source: http://www.actiononsalt.org.uk
Why do food manufacturers use so much salt?

- Preservative

- Taste
  - Inexpensive way to add flavor
  - Habituated to very salty food
  - Can be unlearned (6 wk down regulation of salt receptors)

- Weight of food
Link between salt intake and sugared beverage consumption?

What to do about high salt in the US diet?

- Do nothing and wait for more evidence
- Individual approach to educating about salt reduction
- Public health approach
Modeling health benefits of population-wide reductions in salt

• CHD Policy Model
  – Dynamic population-based computer simulation of heart disease in US adults (Markov model)
  – Inputs Census, Vital Statistics, NHANES, Framingham

• Modeled modest reductions in dietary salt
  – 1 and 3 gm/day
  – Salt reduction lowers BP, thereby lowering CVD risk
  – Small effect sizes in normotensives, larger effect sizes in blacks, hypertensives, elderly
Percent change in incident CHD with 3 gm/day reduction in dietary salt

Percent change in total death events with 3 gm/day reduction in dietary salt by US subpopulations

Comparing salt reduction to other preventive measures (deaths 2010-2019)
Reducing salt ➔ reducing costs

- WHO estimates $1 per person to reduce salt through regulatory means, public campaigns, monitoring.
  - More cost effective than treating all hypertensives
  - Actually cost savings even if only modest reductions in salt achieved.

- Gradual reduction over the decade to 1 gm/day reduction ➔ 7 dollars saved in healthcare for 1 dollar spent.
Salt in the US - 2010

**January** - New York City announces National Sodium Reduction Initiative modeled on UK efforts.

**February-April** - NEJM report and two other reports highlighting the health and economic benefits of population-wide sodium reduction.

**April** - Institute of Medicine releases report recommending that the FDA remove salt from the “Generally Regarded As Safe (GRAS)” categorization.
FDA plans to limit amount of salt allowed in processed foods for health reasons

By Lyndsey Layton
Washington Post Staff Writer
Tuesday, April 20, 2010; A01

The Food and Drug Administration is planning an unprecedented effort to gradually reduce the salt consumed each day by Americans, saying that less sodium in everything from soup to nuts would prevent thousands of deaths from hypertension and heart disease. The initiative, to be launched this year, would eventually lead to the first legal limits on the amount of salt allowed in food products.
**National Sodium Reduction Initiative (NSRI)**

**GOAL**

National health organizations call for a 50% reduction in the amount of salt in restaurant and processed food in 10 years.

- Reduce salt in processed and restaurant food by 50%
- ~40% reduction in population salt intake
- Decrease in blood pressure

150,000 lives saved each year (result of lower intake over lifetime)

To ensure progress toward the 40% reduction in population salt intake, we commit to an interim goal of a 20% reduction in 5 years.

- Setting targets with manufacturers of packaged foods:
  - 62 categories ranging from breakfast cereal to canned soup

- Setting targets with restaurants:
  - 25 categories ranging from biscuits to burritos
Who has joined the NSRI effort?

<table>
<thead>
<tr>
<th>Manufacturers</th>
<th>Restaurants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boar’s Head</td>
<td>Au Bon Pain</td>
</tr>
<tr>
<td>FreshDirect</td>
<td>McCain Foods</td>
</tr>
<tr>
<td>Goya Foods</td>
<td>Starbucks</td>
</tr>
<tr>
<td>Hain Celestial</td>
<td>SUBWAY</td>
</tr>
<tr>
<td>Heinz</td>
<td>Uno Chicago Grill</td>
</tr>
<tr>
<td>Kraft Foods</td>
<td>White Rose</td>
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</table>
Summary and conclusions

• Considerable evidence linking dietary salt to blood pressure elevation and cardiovascular risk.

• Even modest population-wide reductions in dietary salt could yield substantial health benefits in the US.

• The growing burden of hypertension in the US suggests that additional efforts warranted.
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