DIETARY GUIDELINES
SODIUM & POTASSIUM
TOO MUCH & TOO LITTLE
SODIUM & POTASSIUM: WHAT THEY DO

- Minerals
- Potassium: keeps heart rhythm normal
- Sodium & potassium:
  - Control blood acidity
  - Control amount H2O in body
  - Important nerve impulses & muscle contraction
TOO MUCH SALT (SODIUM)

↑ Blood pressure
↑ Heart attack (#1 killer)
↑ Stroke (#3 killer)
↑ Heart failure
↑ Kidney Disease
Know these numbers

Systolic/Diastolic

Normal: 120/80
Pre-hypertension: 121-139/81-89
Hypertension: 140/90 or >

Systolic: heart pumping
Diastolic: heart relaxing
In hypertension,
There's safety in these numbers.

120
80
High Blood Pressure = Hypertension

- 50 million Americans
- “silent killer”
- 90% adults: hypertension with age
- ↑ Children/teens
- ↑ Black Americans
- Obesity, Fast foods, No exercise
- ↑ Alcohol
- Sleep Apnea (breathing pause)
In obstructive sleep apnea, the muscles that normally keep your airway open relax and sag during sleep, causing your tongue, tonsils, soft palate or uvula to repeatedly block your breathing.
Blood Pressure & Age

If you don’t have high blood pressure now, don’t assume you never will. The risk goes up sharply as you age.

Hypertension

- Control of hypertension is **not** good in Americans despite good medications (Dr. Chobanian, BU)
- 28% Americans **unaware** - HBP
- 39%: **no** therapy for HBP
- 65%: blood pressure **not** well controlled (below **140/90**
Children, TV, Blood Pressure

2009 Michigan State University Study

TV watching: children
Blood pressure
Even if children thin & get exercise
As arteries near your heart become more rigid and less able to expand, more force from each heartbeat is passed along to the rest of your blood vessels. This can raise your systolic blood pressure.
Sodium in diet: what you need

- Adequate intake: 1500 milligrams/day
- Above 1500: not needed—unless: strenuous work/exercise
American adult daily consumption (>3,400 mg)
Adult upper level (2,300 mg)
Adult recommended daily (1,500 mg)
Adult needed daily (180 mg)
Where does sodium come from?

12%: naturally- foods
11%: you- salt shaker
77%: \textit{processed foods- added by companies}
## Salt in supermarket foods

<table>
<thead>
<tr>
<th>Food Type</th>
<th>mg sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breads</td>
<td>95-210</td>
</tr>
<tr>
<td>Frozen pizza</td>
<td>450-1200</td>
</tr>
<tr>
<td>Frozen veggies</td>
<td>2-160</td>
</tr>
<tr>
<td>Salad dressing</td>
<td>110-505</td>
</tr>
<tr>
<td>Salsa</td>
<td>150-240</td>
</tr>
<tr>
<td>Tomato soup</td>
<td>700-1260</td>
</tr>
<tr>
<td>Food</td>
<td>mg sodium</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Tomato juice</td>
<td>340-1040</td>
</tr>
<tr>
<td>Potato chips</td>
<td>120-180</td>
</tr>
<tr>
<td>Tortilla chips</td>
<td>105-160</td>
</tr>
<tr>
<td>Pretzels</td>
<td>290-560</td>
</tr>
</tbody>
</table>
Soup Wars: Theory- → Economy: attack your opponents harder. Aggressive ADS: attacking competitor by name

690 mg Sodium

PROGRESSO Light Southwestern-Style Vegetable

480 mg Sodium

Select Harvest Light Southwestern-Style Vegetable
Campbell & Sea Salt

We searched the world for the very best sea salt, and found one so naturally flavorful...

...it helps us use less salt.

Campbell’s Tomato Soup: 410-480 mg Sodium
Dietary Guidelines: 2300 milligrams/day

Special Populations: 1500 milligrams/day

- People with hypertension
- At risk: Black Americans, middle-aged/older adults
- Salt-sensitive people
Potassium & Blood Pressure

Potassium: **Anti-salt**
- Blood pressure
- Risk- stroke
- Kidney stones
- Bone loss

Recommendation: **4,700 mg/day**
Average American: ½ this amount

Oxalates (food) binds to calcium → stone

2 risk factors:
1) not enough drinking of fluids
2) too much salt

Tessa Cesario 11 years old
What’s important: balance of sodium & potassium in diet
Simple way: better balance

↓ Added salt/processed foods

↑ Fruits & veggies
(low sodium, high potassium)
How sodium/potassium imbalance produces hypertension

1. Arteries: direct effect: "vascular resistance" contracted not relaxed
2. Effect on **kidneys**

- Our kidneys evolved: **conserve** sodium & **excrete** potassium (homeostasis)
- Prehistoric diet
Today’s diet: **overloads** kidney’s with salt (sodium)

Our kidney’s have not adapted to “modern” diet
3. Sodium/potassium in cerebrospinal fluid: affects brain impulses → blood vessels → vasoconstriction → blood pressure
Genetics & high blood pressure

• Several genes: affect arteries & kidneys: produce hypertension

• Made worse by sodium/potassium imbalance in diet
Hypertension, heart attacks, stroke

• Blood pressure: shearing affect (stress)- artery lining
• Drives cholesterol into arteries
• Cholesterol deposits- build up
• Blockage ➔ heart attack
• ➔ stroke
High blood pressure water pill: diuretic

- Loss potassium → urine
- Replace with OJ, bananas, potassium supplement
- Potassium helps diuretic lower Blood Pressure
- ↑ potassium diet/supplement: people reduce/stop B.P. pills
Natural way to control blood pressure

• Return to caveman diet
• Dietary Approaches to Stop Hypertension (DASH) Eating Plan
• National Heart, Lung & Blood Institute
DASH

- ↑ Fruits & veggies
- Low fat milk (calcium) products
- Eat more: poultry, fish, nuts
- Eat less: red meat, sugar in processed foods/drink

If all Americans ate DASH: dramatic drop in heart attacks/ stroke
DASH DIET

Sweets (1 per day)

Beans, nuts, seeds (1 per day)

Oils, salad dressing, mayonnaise (2–3 per day)

Low-fat dairy (2–3 per day)

Seafood, poultry, lean meat (0–2 per day)

Grains (preferably whole) (7–8 per day)

Vegetables and fruit (8–10 per day)
SALT HAPPENS.

FIGHT BACK.

Help control blood pressure with NEW Promise® SuperShots®
as part of a potassium-rich, low-sodium diet

Because salt is hidden in lots of foods, these delicious fruit blends are a good source of potassium. Diets that provide potassium help flush sodium from your body. And diets containing foods that are good sources of potassium and low in sodium may reduce your risk of high blood pressure and stroke.

Promise® SuperShots®—a deliciously unique way to have more potassium in your life.

For more information on potassium benefits, go to WebMD.

Potassium benefits WebMD

superShots®
TIA’s (Little Strokes)

- **Transient ischemic attacks**
- **Ischemia**: deficiency blood flow to organ
- Temporary ↓ blood to brain
- Few minutes- 24 hours
- Symptoms disappear
TIA symptoms

- Sudden weakness/numbness face/arm/leg (one side)
- Lack- coordination
- Vision loss/double vision
- Difficulty speaking/understanding
- Dizziness, loss balance, difficulty walking
Cause of TIA

• Fatty deposits \textbf{(plaques)} narrow brain arteries \textbf{(atherosclerosis)}

• Plaque piece breaks loose
  plug brain artery \textbf{temporary}

\textbf{WARNING:} big stroke is on way
Get help \textbf{ASAP}
Stroke

- Often morning - during sleep
- Wake up: can’t speak, paralyzed - one side
Signs of a Stroke

If you or someone else has one or more of these warning signs, don't wait.

**Call 911 immediately, even if the signs go away.**

Other, less common signs include double vision, drowsiness, nausea, or vomiting.

Stroke: warning signs

- Sudden numbness/weakness - face/arm/leg: one side
- Confusion: trouble speaking/understanding
- Trouble seeing: one/both eyes
- Trouble walking, dizziness, loss balance/coordination
- Sudden: severe headache
Ischemic vs. hemorrhagic stroke

- **Ischemic**: due to atherosclerosis
- **Blood clot (thrombus)** → rough plaque → surface
- Or **wandering clot (embolus)** from heart valve/other artery body death brain plugs brain artery cells
Embolus

PLAQUE BUILDUP ON WALL OF DISEASED CAROTID ARTERY

HEALTHY CAROTID ARTERY
Carotid artery surgery

If blood flow to the brain is blocked by an obstruction in the carotid artery, a surgical procedure called an endarterectomy may be done. Clamps are placed on the artery to stop blood flow while fatty deposits (plaques) inside the artery are removed with a dissecting tool.
Peripheral Artery Disease

Poor leg circulation can lead to heart attack or stroke.
Hemorrhagic Stroke

- Artery in brain leaks or ruptures

An aneurysm is a ballooning of an artery from a weak area in its wall. Over time, the wall stretches and becomes thin enough to rupture.
Death- brain neurons: rapid

Average stroke: lasts 10 hours-
kills >5% of neurons in forebrain

Neuron loss from a typical ischemic stroke

2.5 billion neurons

AVERAGE STROKE

Stroke Duration

0 4 8 12 16
• Stroke right side brain
  left side body impairs

• Vice versa

Different areas of the brain control bodily functions.
Possible outcomes

• Difficulty understanding/speaking words (word blindness)
• Impaired movement, sensation, bladder/bowel functions, breathing, swallowing, balance, hearing, seeing, coma
• Psychological: helplessness, frustration, mood changes
Figure 5.8 Drawings by a Patient Whose Stroke Damaged the Sensory Association Cortex. The stroke affected the right parietal cortex, causing the patient to be less aware of objects on his left side. Consequently, he failed to copy the left sides of the two pictures. (From S. P. Springer and G. Deutsch, Left Brain, Right Brain, San Francisco: Freeman, 1981, p. 174.)
Stroke: Are you at risk?  Risk Factors

- Family history: stroke or TIA
- ↑ Age
- **Women:** 53% stroke victims
  Ages 45-54: 2X risk vs. men
- Blacks > whites
- ↑ Blood pressure
Stroke: Risk Factors

- Cardiovascular disease: congestive heart failure, heart attack, heart valve disease, atrial fibrillation (15-20% strokes)
Stroke Risk Factors

• Smoking
• Diabetes
• High blood cholesterol (LDL)
• Lack of physical activity
• Atrial Fibrillation (AFIB)
Figure 1. Mechanism of Cardioembolic Ischemic Stroke Caused by Atrial Fibrillation.
Stroke victim profile

• **Dr. Diana Fite**: ER doctor-
  Houston, age 53

• B.P. 200/120 ➔ nothing done
Stroke victim profile

• June 7, 2006- driving: right hand wheel, left hand cell phone
• Suddenly: right side body weakness
• Couldn’t steer, couldn’t take foot off gas pedal
• Ambulance: ER
ER treatment she requested

• Injection: tissue plasminogen activator (tPA): dissolves clot
• The only effective ER treatment
• Must be given: within 3 hours
• Most people wait or ER’s not properly equipped (stroke)
• She survived- no disability
Stroke victim profile

• **Michael Collins** - police officer - Maryland, 49 years old

• Stroke in police car - numbness left hand

• Forced to retire: Police must shoot either hands
Tedy Bruschi  Linebacker Patriots
Stroke at age 32
Blood clot- hole in heart → brain
“I woke up… pain in back of my neck. Left side of my arms & leg felt funny… some numbness.” Globe 9/2/05
Women and Strokes

- 800,000 Americans have strokes/year
- 3 out of 5 stroke deaths: women
- Women: nontraditional stroke symptoms

Mental confusion, disorientation, pain in face, lightheadedness, weakness, nausea, chest pains & palpitations
Women at risk of stroke

• Menopause
• Abdominal obesity
• Hormone replacement therapy (estrogen +/- progestin)
• Atrial Fibrillation
• Migraines
Stroke Prevention Women

- Control blood pressure
- Stop smoking
- Cholesterol & Triglyceride
- Regular exercise
- Limit alcohol (1 drink/day)
- Overweight or obese: lose weight
- > 65: AHA: 81 mg aspirin/day
Stroke Rehabilitation

Robotics & Strokes
Stroke patient tries to move arm

Sensors: skin triceps sends Signal ➔ robotic arm brace

- Robot motor: reinforces Patient’s movements:
  Arm moves
- “Amplifies” patient’s muscle activities
KEY POINTS

REDUCE YOUR BLOOD PRESSURE

- Increase Potassium Intake (fruits & vegetables)
- Increase Exercise
- Lower Salt (sodium) Intake (processed foods)
- Lose Excess Weight
KEY POINTS

SODIUM

Limit: 2300 milligrams per day

Food Label Key Words:
- low sodium, low salt, no-salt added,
- reduced sodium/salt, sodium-free, unsalted

Avoid: sodium, salt, sodium chloride

Limit your use of salt:

At the table, during cooking, in cold-cuts
and preserved meats, prepared foods,
soy sauce, “ready-to-eat” foods, packaged
foods/snacks
KEY POINTS

POTASSIUM

Recommendation:

4,700 milligrams every day

Consider these*:

Tomato paste/puree/sauce, sweet potato, beet greens, baked potato, beans (white, soy, lima, kidney), cooked dry beans, yogurt, clams, prune juice, carrot juice, blackstrap molasses, halibut, tuna, winter squash, rockfish, cod, bananas, spinach, tomato juice, peaches, prunes, non-fat/low-fat milk, apricot, rainbow trout, cantaloupe, honeydew melon, lentils, plantains, oranges, orange juice, split peas.
Are all pizzas created equal?

• Visit the following restaurants. Ask to see a Nutrition Information sheet. Note response. If hardcopy is not available, go to their WEB site to find nutrition information.

• Restaurants: Pizza Hut, Papa Ginos, Pizzeria Uno, Dominos, Caesar’s
Get Information: **small cheese pizza**

- Serving size (assume: 1 pizza) and grams
- Calories
- Calories/gram
- Total fat (grams)
- Saturated fat (grams)
- Trans fat (grams)
- Cholesterol (milligrams)
- Sodium (milligrams)
Are all **frozen pizzas** the same?

- Visit a supermarket’s frozen food section.
- Find the following frozen cheese pizzas: **Mystic, Stouffer’s, Celeste, Ellios, DiGiorno, Tombstone, California Pizza Kitchen**
Get information for a cheese pizza

- **Serving size** (assume: 1 pizza) and grams
- **Calories**
- **Calories/gram**
- **Total fat** (grams)
- **Saturated fat** (grams)
- **Trans fat** (grams)
- **Cholesterol** (milligrams)
- **Sodium** (milligrams)