

# Bottled Water vs. Tap Water

## Which is Better?



LaDonna McCowan, Ph.D.  
Maifan Silitonga, Ph.D.

Southern Region Water Quality Conference  
*Racing to Success*  
October 23-26, 2005  
Lexington, Kentucky



# Who is watching your water?

- **Tap Water** – EPA, Department of Environmental Quality (DEQ), and the local utility
- **Bottled Water** – Food and Drug Administration (FDA) and the bottling company

# Bottled Water vs. Tap Water

- **Bottled water** – regulated as a food. Based on truth in labeling. Very little public oversight.
- **Tap water regulations** – based on environmental regulations. Has a lot of public oversight.

## MORE ABOUT BERYLLIUM AND CADMIUM

Two of the 2,160 tests done in 1998 showed results that needed additional testing because they indicated two metals – beryllium and cadmium – in amounts that were higher than the federal government allows. Testers took repeat samples as soon as the high test results were received. The repeat tests found no beryllium or cadmium. How could that happen? Unusual results sometimes occur because the amount of water sampled is very small compared with the many millions of gallons of water treated every day. A speck or two may get into the water sampled, but not be found anywhere else in our distribution system. Fortunately, the metals found have the potential to harm public health only after many years of exposure to levels above the federal standard, which is called the Maximum Contaminant Level, or MCL. During 1998, the average levels for beryllium and cadmium were below the federal standards which are set in parts per billion.

**BERYLLIUM** - The February 1998 monthly sample from the Mohawk plant showed a level of 13 parts per billion of beryllium – 7 parts above the Maximum Contaminant Level, or MCL. Some people who drink water containing beryllium well in excess of the MCL over many years could develop intestinal lesions. Previous and follow-up samples did not show beryllium was present.

**CADMIUM** - The October 1998 monthly sample from the A. B. Jewell plant showed a level of 19 parts per billion of cadmium – 15 parts above the Maximum Contaminant Level, or MCL. Some people who drink water containing cadmium in excess of the MCL over many years could experience kidney damage. Previous and follow-up samples did not show cadmium was present.

## Monitoring Tulsa's Water Quality

Measuring tiny amounts such as parts per billion requires high tech equipment and trained specialists. The metals and organic laboratory is located at the A. B. Jewell plant. Lab workers help assure the safety of Tulsa's drinking water.



## QUALITY ASSURANCE – TEST RESULTS TABLE

The test results table is based on samples of treated water from the Mohawk and A. B. Jewell plants. Substances not listed were not found in the treated water supply. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791).

Contaminant	Unit	Goal (MCLG)	Maximum allowed (MCL)	What we detected at:		Major sources in drinking water
				A. B. Jewell Highest	Mohawk Lowest	
Barium	ppm	2	2	0.12 less than 0.010	0.11 0.029	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
<b>BERYLLIUM</b>	ppb	4	4	*	<b>13</b> less than 4	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries
<b>CADMIUM</b>	ppb	5	5	<b>19</b> less than 4	*	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries & paints
Copper	ppm	1.3	AL=1.3	<b>0.063</b> less than 0.02	<b>0.036</b> less than 0.02	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Fluoride	ppm	4	4	1.04 0.93	1.04 0.85	Naturally occurring in small amounts in source lakes; in the 1950s, waters approved adding more fluoride to promote strong teeth
Lead	ppb	0	AL=15	4 less than 1	*	Corrosion of household plumbing systems; erosion of natural deposits
Nitrate	ppm	10	10	<b>0.93</b> less than 0.03	<b>2.88</b> less than 0.03	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Nitrite	ppm	1	1	*	<b>0.055</b> less than 0.03	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Trihalomethanes	ppb	0	100	81 71	50 39	By-product of drinking water chlorination
Turbidity	NTU	NA	TT	<b>0.18</b> 0.09	<b>0.24</b> 0.07	Silt runoff

Maximum contaminant level goal or MCLG: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety. Maximum contaminant level or MCL: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

AL or Action level: The concentration of a contaminant which, if exceeded, triggers a treatment or other requirement which a water system must follow.

NTU or Nephelometric Turbidity Units: A measurement of the turbidity, or cloudiness, of the water. Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and unsightly headaches.

TT or Treatment technique: A required process intended to reduce the level of a contaminant in drinking water.

ppm: Parts per million. Comparable to 1 minute in two years.

NA – Not applicable

ppb: Parts per billion. Comparable to 1 minute in 2,000 years.

\* Not detected at the plant



# City of Tulsa – 1998 Consumer Confidence

## Report

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# Cost of Bottled Water

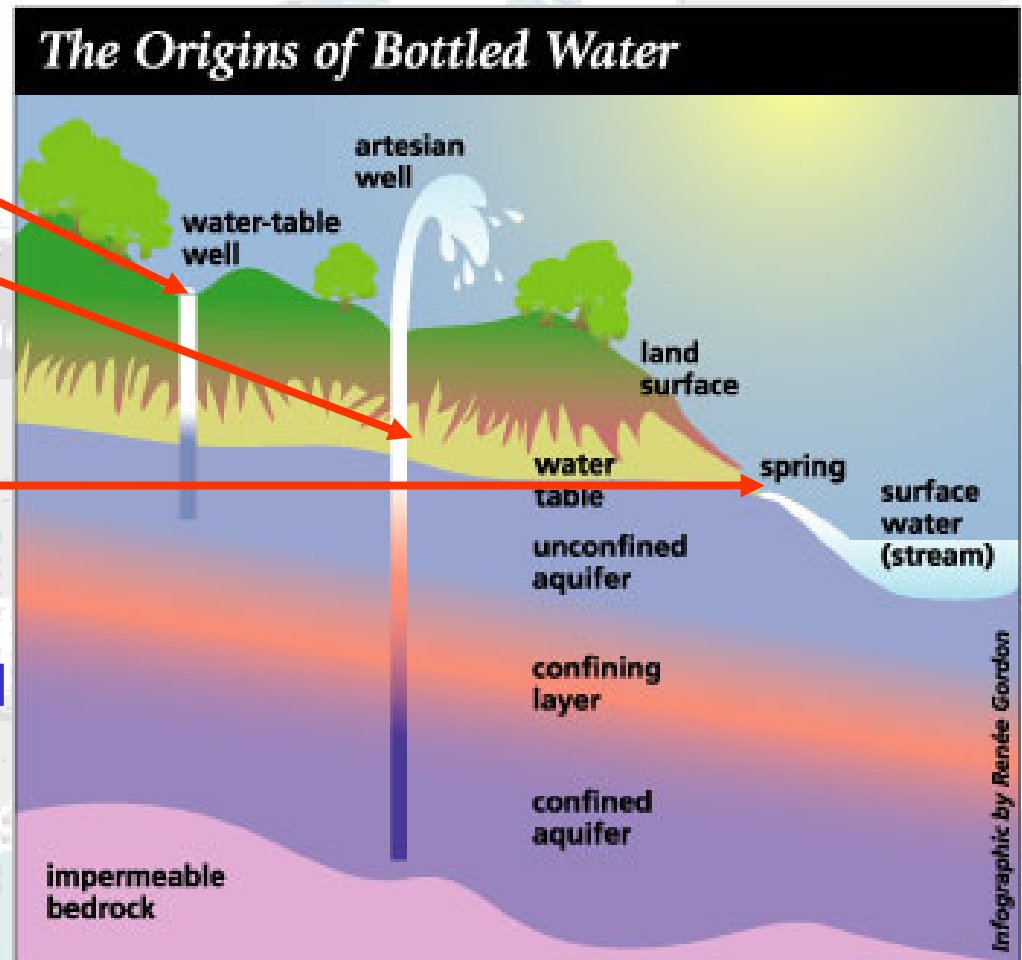
- Dasani, Evian, Ozarka: \$4.00/gallon or more
- Drinking Water: 59¢/gallon
- RO Water from grocery: 33¢/gallon
- Water pitcher filter: 5-10¢/gallon
- Tap water: 0.3-2¢/gallon or less



\$42/case

# Types of Bottled Water from Underground Sources (FDA Rules)

- **Well water.** Any underground water
- **Artesian well water.** Underground water under pressure with a confining layer of rock or clay.
- **Spring water.** Underground water that flows naturally to the surface.
- **Mineral water.** Underground water with high mineral content. Minerals may not be added.





# Bottled Water from Various Sources (FDA Rules)

- Drinking Water
- Distilled Water
- Reverse Osmosis Water
- Nursery Water

Usually originates from tap water.



# What about Fluoride?

- Fluoride is added to tap water in most public systems. It provides protection to teeth.
- Most bottled water contains no Fluoride.
  - Reverse Osmosis (RO) removes Fluoride.
  - Distillation removes Fluoride.



# Nursery Water

Specially Formulated for Infants and Toddlers



Since 1948

# NURSERY®

Purified Water with added Fluoride

Steam distilled. Sodium free. Not sterile. Use as directed by physician or by labeling directions for use of infant formula.

Net 1 GAL (3.78 L)

Use it for...

- Drinking
- Diluting Juice
- Mixing with Cereals
- Preparing Baby Formula

Since 1948  
**NURSERY®**

Purified Water with added Fluoride

Purified by steam distillation, filtered and ozonated to insure quality. Contains purified water with selected minerals (potassium bicarbonate, calcium chloride, magnesium chloride, sodium fluoride) added for taste. Contains up to 0.6 mg/L added fluoride. Mineral amounts are not nutritionally significant.

Bottled by DS Waters of America, LP, Atlanta, GA 30328.

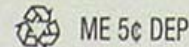
☎ For information call 1 (800) 682-0246

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[nurserywater.com](http://nurserywater.com)



CA CASH REFUND

## Nutrition Facts

Ser. Size 8 fl. oz. (240 mL)

Serv Per Container: About 16

### Amount Per Serving

Calories 0

Amount

**Total Fat** 0g

**Sodium** 0mg

**Total Carb.** 0g

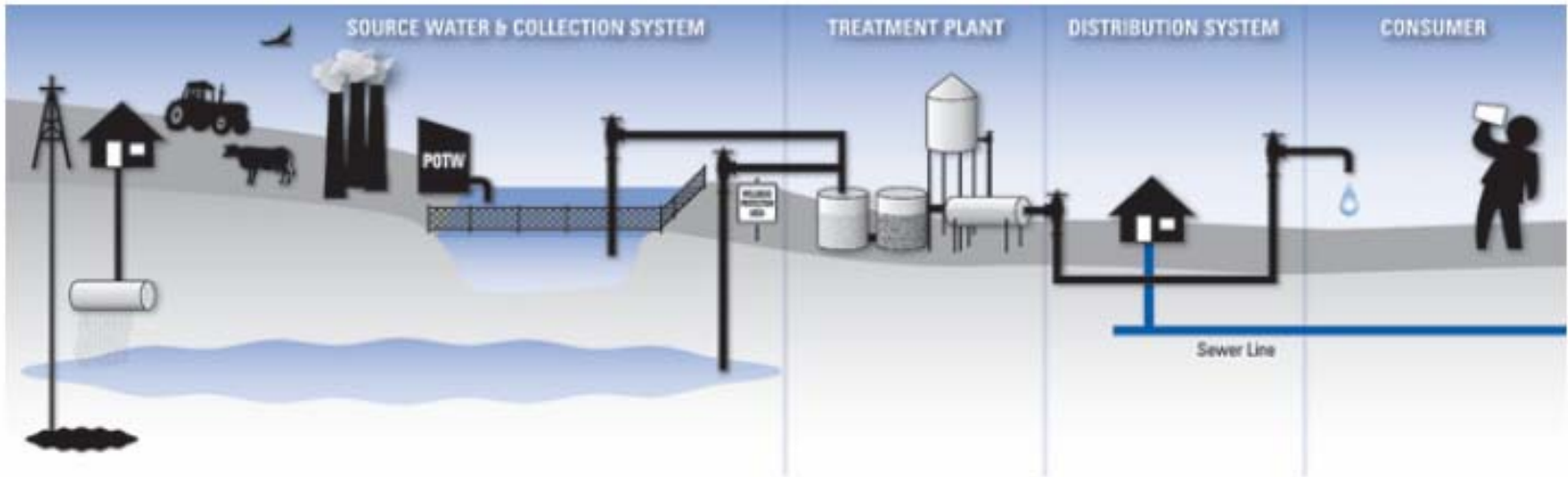
**Protein** 0g

Not a significant source of calories from fat, cholesterol, dietary fiber, sugars, Vitamin A, Vitamin C, calcium and iron.

# Protection of Tap Water

- The Safe Drinking Water Act sets the rules.
  - Implemented by EPA, Oklahoma Department of Environmental Quality (DEQ), and the water utility.
  - A Multiple Barrier Approach

# The Multiple Barrier Approach to Protect Tap Water – 3 levels



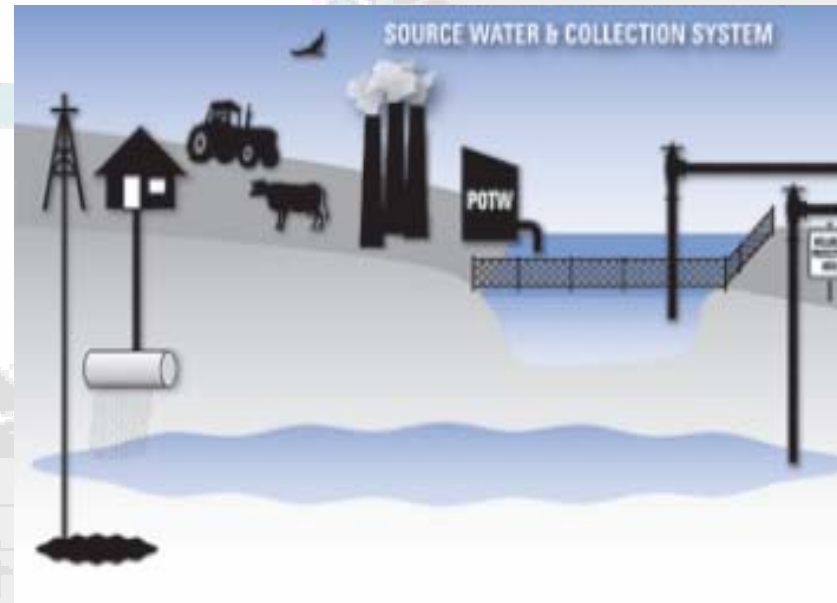
## II. Ensuring Safe Drinking Water Through the Multiple-Barrier Approach

Whether your tap water comes from surface or ground water, all drinking water sources are vulnerable to a variety of contaminants from a variety of activities. The origin of contaminants might be in your neighborhood or many miles away. When rain falls or snow melts, it picks up and carries away pollutants, depositing them into lakes, rivers, wetlands, coastal and even underground sources of drinking water. Because we know these activities have the potential to

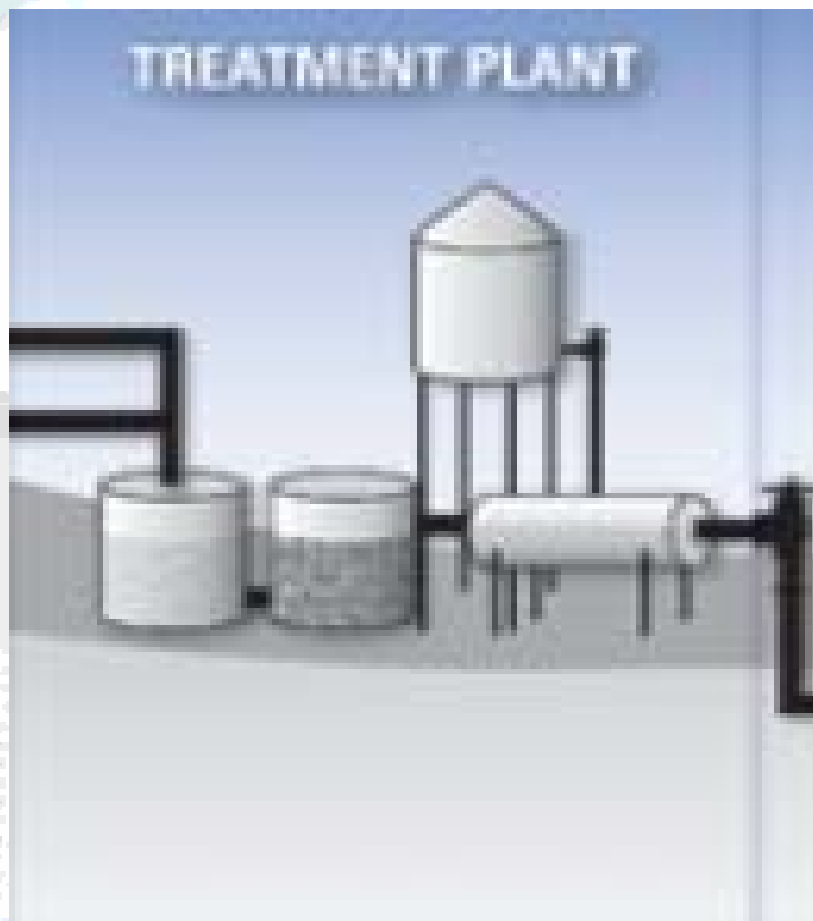


# Barrier 1. Source Protection System

- **Oil & Gas Sources** – Oklahoma Corporation Commission
- **Underground storage tanks** – Oklahoma Corporation Commission
- **Agricultural Sources** – Oklahoma Department of Agriculture, Food and Forestry
- **Air pollution Sources** - Oklahoma Department of Environmental Quality
- **Wastewater treatment effluent** - Oklahoma Department of Environmental Quality
- **Well Head Protection and Source Water Protection Programs** - Oklahoma Department of Environmental Quality



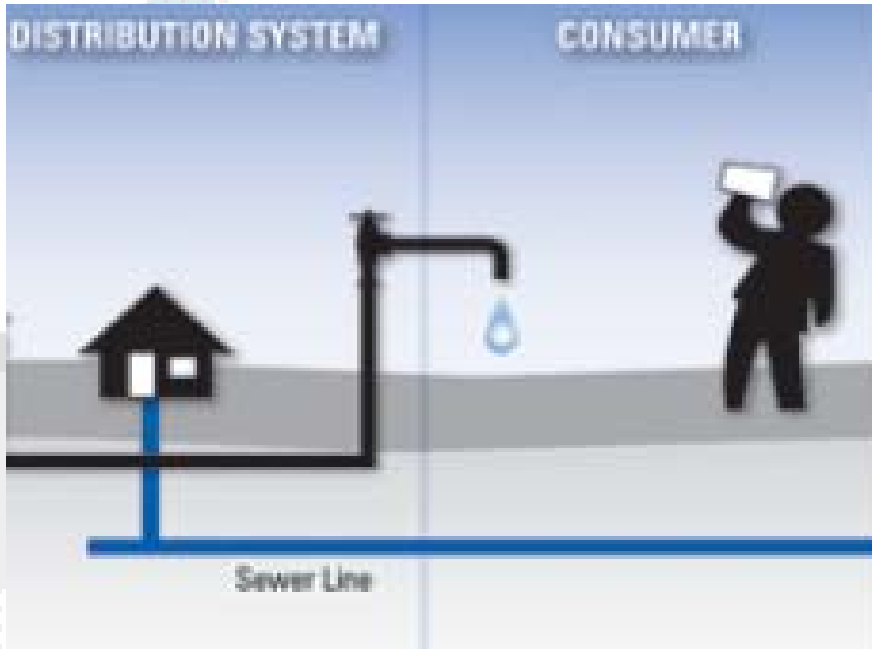
# Barrier 2. Water Treatment System



- Drinking water treatment standards
- Disinfection standards
- Laboratory certification
- Priority Pollutant Testing
- Public Notification
- Penalties for violation



# Barrier 3. Distribution System



- Vulnerability assessments
- Security programs
- Lead program
- Consumer watchfulness

## General Rules

### EPA Tap Water

### FDA Bottled Water\*

- Priority pollutant testing required

- Priority pollutant testing required

- Standards violations enforceable by DEQ

- Must be labeled as "untreated"

- Chemical and microbe testing: frequency based on system size

- Chemical testing required: 1 per year; microbial testing weekly

- Certified lab tests required

- No FDA rule

- Violations must be reported to the EPA, DEQ, and the public.

- No FDA reporting rule

- Trained system operators required.

- No FDA rule

# Is Bottled Water Safer than Tap Water?

- Not necessarily
  - Large public water suppliers (more than 100,000 customers) are very safe.
  - Small suppliers (fewer than 10,000) are generally safe.
- Tap water supplies Fluoride.
- Bottled water has less government oversight and results are out of public view.

# Is Bottled Water Better?

It may just be a matter of  
taste...

# Problems in Drinking Water

- Bacteria
- Mineral content
  - Total Dissolved Solids
  - Hardness
  - pH



# Household Water Treatment Equipment



# Types of Household Water Treatment

- **Disinfection - to kill or remove pathogens**
- **Filters - to remove sediment, organics, taste and odor**
- **Distillation and Reverse Osmosis – to remove minerals**
- **Ion exchangers (softeners) - to remove hardness, Iron, Manganese**

# Disinfection – to kill Bacteria & Viruses

- Chlorination
  - Shock chlorination
  - Continuous chlorination
- Ultraviolet Light
- Ozonation

# Filters

- Oxidizing (greensand) filters remove iron, manganese and  $H_2S$
- Neutralizing filter to Control Corrosion

# Removing Minerals

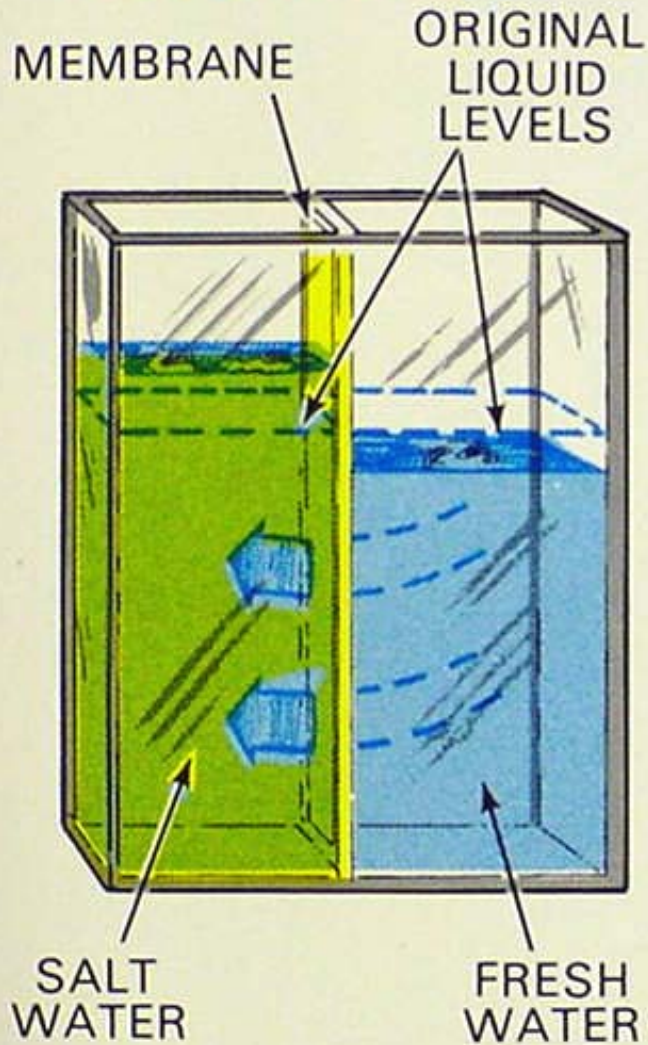
- Iron & Manganese – water softeners, oxidizing filter
- Calcium & Magnesium (hardness) – water softener
- Corrosion - neutralizer



# TDS/Mineral Treatment

- Reverse Osmosis
- Distillation

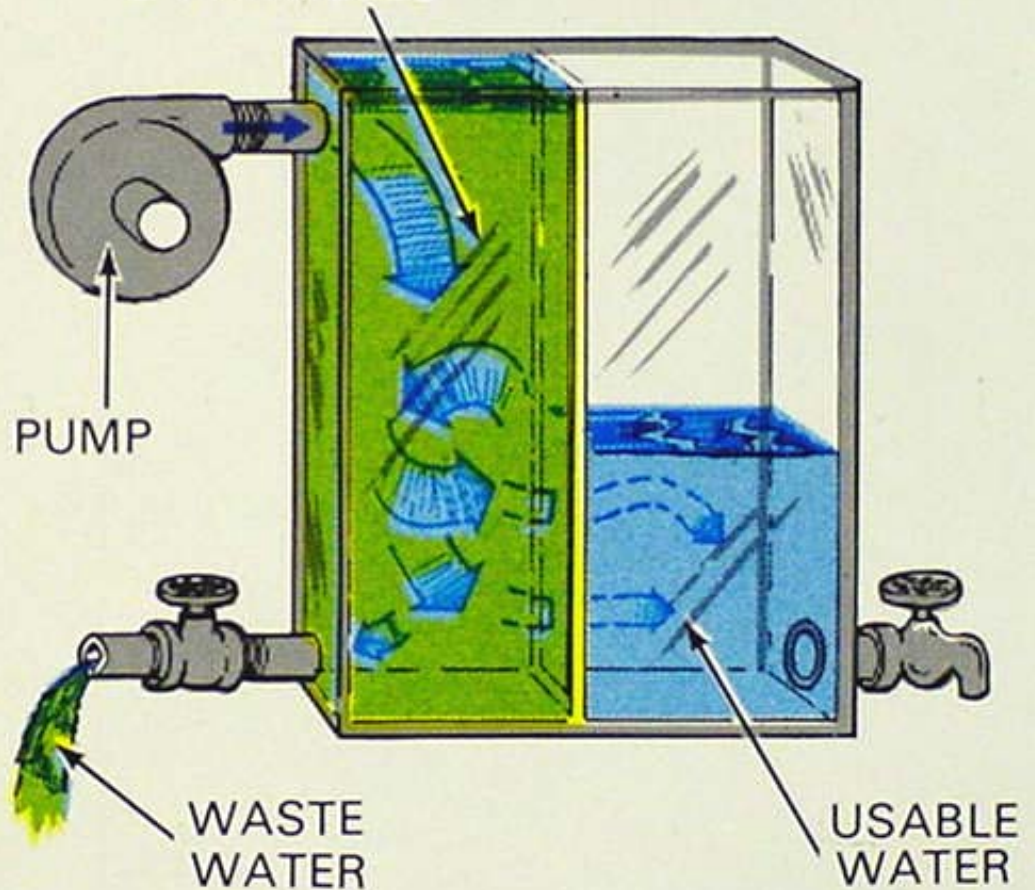
# OSMOSIS



(a)

# REVERSE OSMOSIS

WATER CONTAINING  
DISSOLVED MINERALS  
& PARTICLES

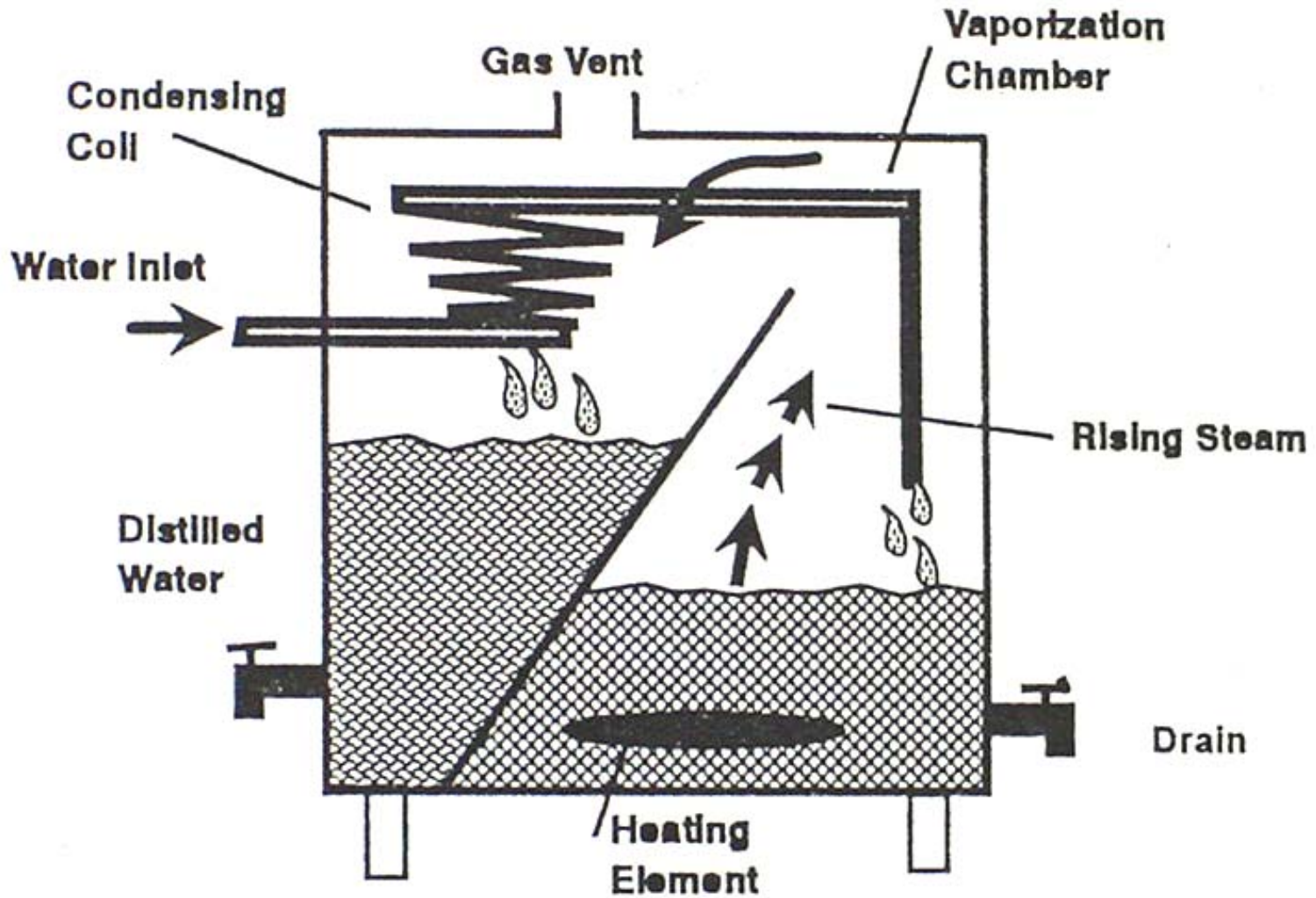


(b)





# Distillation Unit



# Counter Top Distillation Unit





# Carbon Filters

- Remove taste, odor and organic contaminants by adsorption on carbon particle surface
- Hierarchy of contaminant adsorption
- Saturated filters can actually increase concentration of some contaminants
- Not effective on nitrate, hardness or bacteria
- Filter cold water only
- Bigger is better - more surface area



**OMNIFILTER**  
UnderSink Water Filter  
**SFM2**  
GAC1 Cartridge

**OMNIFILTER** UnderSink Water Filter  
Model **SFM2** 038398

Performance Data	
Flow Rate (GPM)	1.0
Flow Rate (LPM)	3.8
Flow Rate (GPD)	15.0
Flow Rate (LPH)	56.8
Flow Rate (MGD)	0.00015
Flow Rate (MLPH)	0.00057

**Performance Data**

Flow Rate (GPM)	Flow Rate (LPM)	Flow Rate (GPD)	Flow Rate (LPH)	Flow Rate (MGD)	Flow Rate (MLPH)
1.0	3.8	15.0	56.8	0.00015	0.00057

**Operating Pressure** 1/2" to 1" (1.5 to 3.5 bar)

**Operating Temperature** 40°F to 140°F (4°C to 60°C)

**Flow Rate** 1.0 GPM (3.8 LPM) at 1.0 bar (14.7 psi)

**Flow Rate** 0.5 GPM (1.9 LPM) at 0.5 bar (7.35 psi)

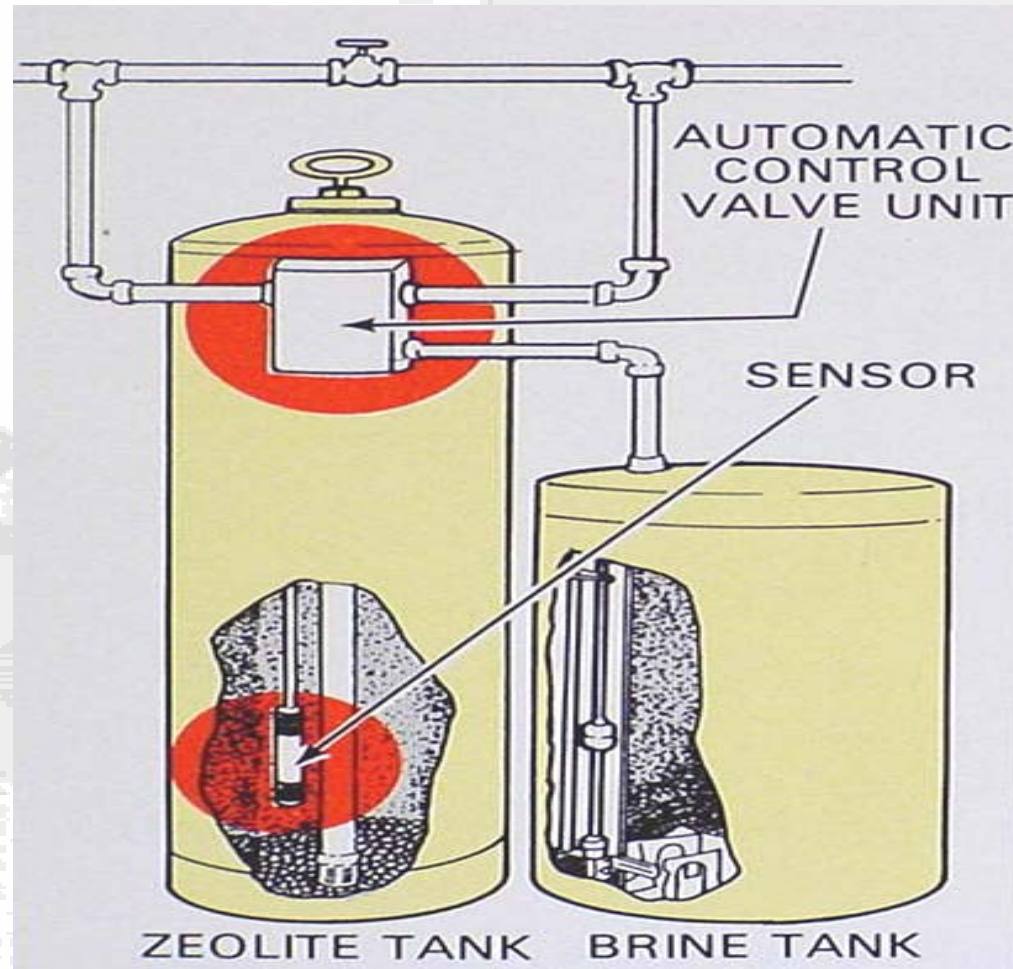
**Flow Rate** 0.2 GPM (0.76 LPM) at 0.2 bar (2.94 psi)

**Flow Rate** 0.1 GPM (0.38 LPM) at 0.1 bar (1.47 psi)

**OMNIFILTER**  
**WARNING! HAND TIGHTEN ONLY**  
Use OMR1 Wrench only for tank removal.  
Replace tank "O" ring with every other  
filter cartridge change.

# Ion Exchange Water Softeners

- Exchange sodium ions for calcium and magnesium ions in water
- Increase EC
- May be dietary hazard - hypertension (adds  $\cong 140$  mg/l of sodium in “Hard” water)
- Use potassium salt (KCl) for health reasons



# Problems and Appropriate Equipment

Problem	Equipment
Bacteria	Disinfection
Sediment	Filter
Minerals	Distillation and Reverse Osmosis
Salts	
Nitrate	
Iron and Manganese	Softener and Oxidizing filter
Hardness	Softener
Organics	Carbon filter

# Summary

Tap water is

- stringently regulated
- Readily available
- costs less

Bottled water is

- More consistent in taste
- More convenient

# Water Tasting Results

Label	NO3	TDS	Rank 1	Rank 5
A = Spring Water Deer Creek (bottled)	5	160	21	2
B = Distilled (bottled)	0	0	11	14
C = Tap Water	1	350	10	14
D = Well Water (Oklahoma)	1	940	5	24
E = Tap Water (Filtered)	1	320	18	7

Total Participants = 65 people

4 participants said there were no difference between the water samples

1 participant scored A and C as the best

1 participant scored A, B, D, and E the same



# Questions??

**LaDonna McCowan, 405-744-7532, 218 Ag Hall**

**Maifan Silitonga, 405-744-8419, 214 A Ag Hall**

**<http://waterquality.okstate.edu>**

# Water . . .

# It's a Matter of Taste