

Brains Under the Influence

Teacher Information

..... just add students™

Summary

What factors affect blood alcohol concentration (BAC)? Students conduct simulated blood alcohol tests. They match six mini-cases with the parts of the brain affected by alcohol. They learn about alcohol poisoning and the effects of binge drinking on teen brains.

Core Concepts

- The effects of alcohol on the brain lead to changes in behavior and possibly even death.
- Alcohol poisoning can have serious consequences.
- Teen binge drinking leads to changes in brain structure and function.

Time Required

Two 40-minute class periods

Kit contains

- Tubes of simulated blood plasma from a female after 2, 4, and 6 drinks
- BAC Test Kit containing 3 Blood Alcohol Test Strips and BAC testing instructions
- Factsheet on alcohol poisoning
- Article on teen binge drinking
- Sheet of mini-case cards describing the behavior of six individuals after drinking

Teacher Provides

- Safety goggles
- Paper towels for clean up
- Scissors

Warning: Choking Hazard

This Science Take-Out kit contains small parts. Do not allow children under the age of seven to have access to any kit components.

Reusing *Brains Under the Influence* kits

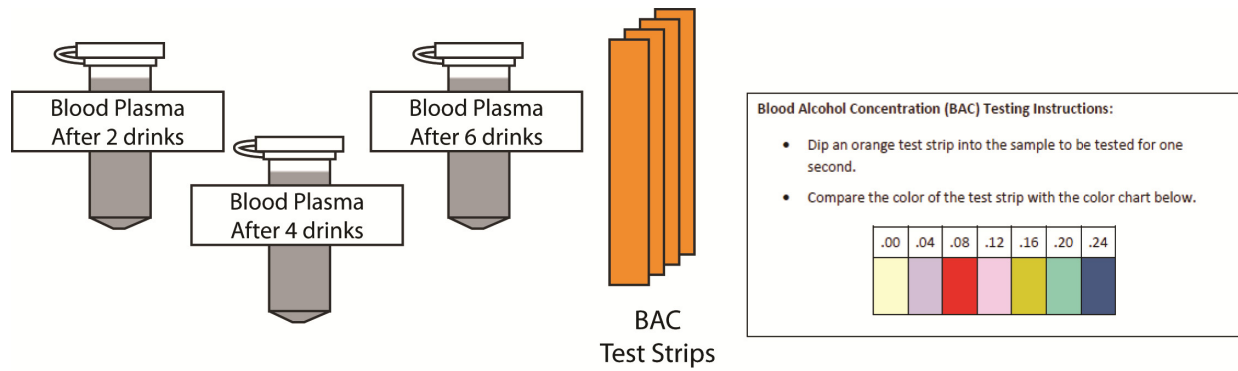
Kits may be refilled and reused. Allow approximately 15–30 minutes for refilling 10 student kits. Teachers will need to instruct students on how to handle clean-up and return of the reusable kit materials. For example, teachers might provide the following information for students:

Discard	Return to kit bag
<ul style="list-style-type: none">• Used Blood Alcohol Concentration Test Strips	<ul style="list-style-type: none">• 3 labeled microtubes• Blood Alcohol Concentration Testing Instructions• 6 “drinking and behavior” cards (Beth, Joe, Tom, Jim, Marie, Cathy)• Factsheet – Alcohol Poisoning (1 page)• Article – Teen binge drinking (1 page)

Each refill pack includes the following materials:

- 3 graduated transfer pipets (for teacher use in refilling microtubes)
- 15 mL of “Blood Plasma after 2 Drinks”
- 15 mL of “Blood Plasma after 4 Drinks”
- 15 mL of “Blood Plasma after 6 Drinks”
- 40 “Blood alcohol test strips”
- 10 **Blood Alcohol Concentration and Behavior**

Kit Contents Quick Guide



Blood Alcohol Concentration and Behavior

Teen Binge Drinking Causes Irreversible Brain Damage

Factsheet: Alcohol Poisoning

What Happens to a Person with Alcohol Poisoning?

When a person has alcohol poisoning, his or her blood alcohol level is so high that it poisons the nerves that control breathing rate, heart rate and the gag reflex. If the gag reflex isn't working properly, a person can choke to death on their own vomit.

Especially dangerous because the victim can ingest a fatal dose of alcohol before they are fully conscious. A person's blood alcohol concentration (BAC) can continue to rise even if they are passed out. Even after a person stops drinking, alcohol in the stomach can enter the bloodstream and circulate throughout the body. It is very dangerous because the victim can ingest a fatal dose of alcohol before they are fully conscious. A person's blood alcohol concentration (BAC) can continue to rise even if they are passed out. Even after a person stops drinking, alcohol in the stomach can enter the bloodstream and circulate throughout the body. It is very dangerous because the victim can ingest a fatal dose of alcohol before they are fully conscious.

What are the symptoms of alcohol poisoning?

- Vomiting or unconsciousness
- Slow or irregular breathing (fewer than eight breaths per minute)
- Staggering (10 seconds or more between breaths)
- Pale or bluish skin color, or hypothermia (low body temperature)

What if you suspect someone has alcohol poisoning?

All symptoms must be present. Do not try to guess the level of drunkenness. If you suspect a person who has passed out may die. If you have any suspicion of an alcohol overdose, call 911 for help.

What if someone with alcohol poisoning goes untreated?

- They can die on his or her own vomit
- Breathing slows, becomes irregular, or stops
- Heart beats irregularly or stops
- Hypoglycemia (too little blood sugar) leads to seizures
- Severe dehydration from vomiting can cause seizures, permanent brain damage, or death
- Even if the person survives, irreversible brain damage may result

Don't be afraid to seek medical help for a friend who has had too much to drink.

Don't worry that your friend may become angry or embarrassed. Remember, you cared enough to help. Always be safe, not sorry.

Cards describing the behavior of six individuals who have been drinking

<p>Beth</p> <p>Beth isn't enjoying the party anymore. She's really kind of confused and depressed. She wants to go home but she's having so much trouble walking that the guy she's with had to carry her to the car.</p>	<p>Joe</p> <p>Joe can't even stand up. He gagged and then vomited but doesn't even seem to notice the mess. He just sits there confused and dazed. He looks like he's about ready to pass out.</p>
<p>Tom</p> <p>Tom is slurring his words. He staggers a bit and needs to concentrate when he tries to walk to the men's room. He keeps trying to get girls to dance with him and then yelling insults when they don't want to dance with him.</p>	<p>Jim</p> <p>Jim is usually shy and inhibited. Tonight he's more relaxed and talkative than usual. He has trouble remembering people's names, but he treats them like they were life-long friends. His reaction time has slowed so he's not sure he should drive home.</p>
<p>Marie</p> <p>Marie is the life of the party. She is dancing enthusiastically and giggling when she bumps into others. She was talking loudly and ignoring the fact that her boyfriend is getting annoyed with her behavior.</p>	<p>Kathy</p> <p>Kathy came late to the party, but she has caught up quickly by chugging a bunch of beers. Then she just staggers to the couch and passes out. Her friends try to wake her up because she is cold, pale, and is not breathing normally.</p>

Read these instructions before using Science Take-Out kits

Parental or Adult Supervision Required

This kit should be used only under the supervision of an adult who is committed to ensuring that the safety precautions below, and in the specific laboratory activity, are followed.

Safety Goggles and Gloves Strongly Recommended

We encourage students to adopt safe lab practices, and wear safety goggles and gloves when performing laboratory activities involving chemicals. Safety goggles and gloves are not provided in Science Take-Out kits. They may be purchased from a local hardware store or pharmacy.

Warning: Choking and Chemical Hazard

Science Take-Out kits contain small parts that could pose a choking hazard and chemicals that could be hazardous if ingested. Do not allow children under the age of seven to have access to any kit components. Material Safety Data Sheets (MSDS) provide specific safety information regarding the chemical contents of the kits. MSDS information for each kit is provided in the accompanying teacher instructions.

Chemicals Used in Science Take-Out Kits

Every effort has been made to reduce the use of hazardous chemicals in Science Take-Out kits. Most kits contain common household chemicals or chemicals that pose little or no risk.

General Safety Precautions

1. Work in a clean, uncluttered area. Cover the work area to protect the work surface.
2. Read and follow all instructions carefully.
3. Pay particular attention to following the specific safety precautions included in the kit activity instructions.
4. Goggles and gloves should be worn while performing experiments using chemicals.
5. Do not use the contents of this kit for any other purpose beyond those described in the kit instructions.
6. Do not leave experiment parts or kits where they could be used inappropriately by others.
7. Never taste or ingest any chemicals provided in the kit – they may be toxic.
8. Do not eat, drink, apply make-up or contact lenses while performing experiments.
9. Wash your hands before and after performing experiments.
10. Chemicals used in Science Take-Out experiments may stain or damage skin, clothing or work surfaces. If spills occur, wash the area immediately and thoroughly.
11. At the end of the experiment, return ALL kit components to the kit plastic bag. Dispose of the plastic bag and contents in your regular household trash.

No blood or body fluids from humans or animals are used in Science Take-Out kits. Chemical mixtures are substituted as simulations of these substances.

Brains Under the Influence: *Teacher Answer Key*

Part I: Blood Alcohol Concentration

When a person consumes an alcoholic beverage, the alcohol is quickly and directly absorbed into the bloodstream and distributed to all parts of the body. As more alcohol is consumed, the percentage of alcohol in the blood rises.

Blood alcohol concentration (BAC) is a measure of the concentration of alcohol that a person has in his or her bloodstream. A BAC of .10 means that a person has one part of alcohol per 1,000 parts of blood. A person's BAC is affected by many factors including how much alcohol is consumed and how quickly the alcohol is consumed.

1. Your lab kit contains blood plasma samples collected from a 120 pound female after she drank 2, 4 and 6 "standard drinks" in an hour.

Standard Drinks:

- 12 ounces of beer with 5% alcohol concentration
- 5 ounces of wine with 12% alcohol concentration
- 1.5 ounces of 80 proof liquor

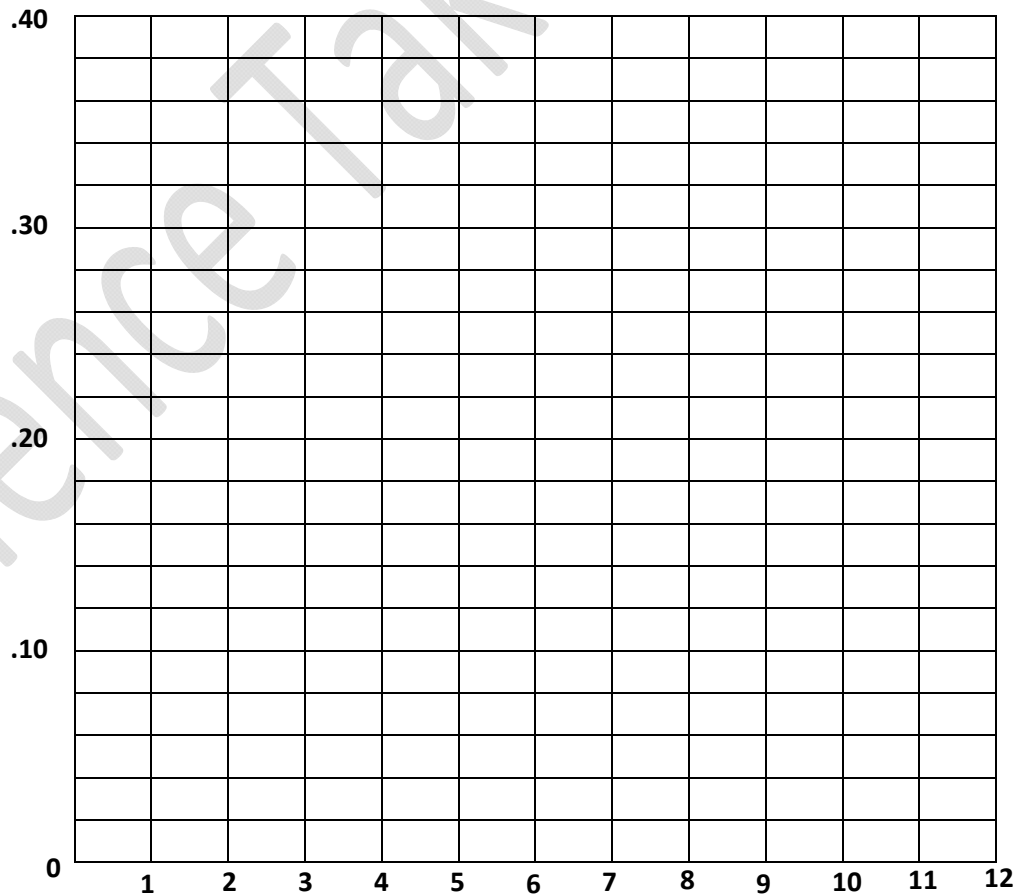
2. Follow the instructions in the **BAC Test Kit** to test the BAC level for each of the blood plasma samples. Record the BAC data in the data table on the next page. *Note: This table already contains data for a 160 pound male after he drank various numbers of "standard drinks" in an hour.*
3. Use the information in the data table to complete the graph on the next page.
 - Write an appropriate title for the graph.
 - Write an appropriate label for each axis on the graph.
 - Plot the data for each person on the graph.
 - Predict the effects of larger numbers of drinks by extending the lines for each person to the right edge of the graph grid.

Data Table: Effect of Alcohol Consumption on Blood Alcohol Concentration (BAC)

Gender and weight	Number of Standard Drinks	Approximate Blood Alcohol Concentration (%)
Female 120 pounds		
Male 160 pounds	2	.05
	4	.09
	6	.14

Graph Title: _____

Key: 120 Pound Female ————— 160 Pound Male - - - - -



1. List three factors which can affect a person's blood alcohol concentration (BAC).

2. For most states, a person is considered legally intoxicated if they have a BAC of .08 or higher.
 - What is the greatest number of standard drinks a 120 pound woman can drink in an hour if she wants to avoid being legally intoxicated? _____
 - What is the greatest number of standard drinks a 160 pound man can drink in an hour if he wants to avoid being legally intoxicated? _____

3. According to the graph:
 - A 160 pound male who drank 10 standard drinks in an hour would have a BAC of _____
 - A 160 pound male who had a blood alcohol level of 0.10 most likely drank _____ standard drinks in an hour.

4. It is estimated that the healthy liver can remove one standard drink per hour from the body. If a 120 pound female had four standard drinks, how many hours would it take before her BAC returned to below .08? _____

Part 2: Effects of Alcohol on the Brain and Behavior

When alcohol in the bloodstream reaches the brain, it immediately begins to affect the way a person behaves. Alcohol is a depressant that interferes with the normal activity of brain cells.

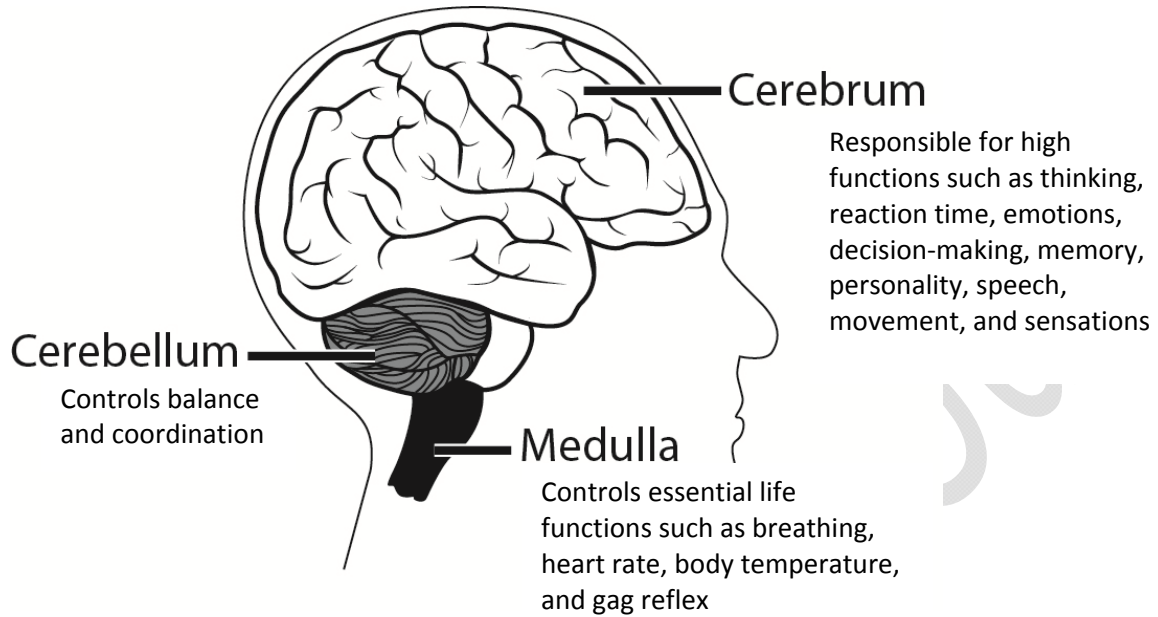
1. Read the descriptions of the behaviors in the **Blood Alcohol Concentration and Behavior** chart. Complete each box in the “Summary” column of this chart by listing at least three effects of the alcohol level on a person’s behavior.
2. Your lab kit contains a sheet describing the behavior of six people at who have been drinking. Cut along the dashed lines to make a set of six cards.
3. Use the information in the **Blood Alcohol Concentration and Behavior** chart to arrange the cards in order from lowest BAC to highest BAC.
4. Record the names of the people on the appropriate lines below.

Lowest BAC: _____

Highest BAC: _____

5. Do you think that you can tell a person’s BAC level from just observing their behavior? Explain why or why not.

The diagram below shows the functions of different parts of the brain.



6. Which part of Jim's brain and Marie's brain are affected by alcohol? Explain your answer.
7. Which parts of Tom's brain and Beth's brain are affected by alcohol? Explain your answer.
8. Which parts of Joe's brain and Kathy's brain are affected by alcohol? Explain your answer.

Part 3: Alcohol Poisoning and Binge Drinking

Your lab kit contains a factsheet on **Alcohol Poisoning**. Use the information in this factsheet to answer questions 1 through 4.

1. What is alcohol poisoning?
2. Which two people from the “cards” are showing signs of alcohol poisoning? Explain your answer.
3. Why is rapid drinking (many drinks in a short period of time) so dangerous?
4. Some people think that a person who passed out should just be left to “sleep it off.” Explain at least four reasons why it is critical that someone who has passed out get immediate medical treatment.

Your lab kit contains an article entitled **Teen Binge Drinking Causes Irreversible Brain Damage**. Use the information in this article to answer questions 5 through 10.

5. How did the researchers define “binge drinking”?

6. Describe two ways that binge drinking can affect the learning abilities of both male and female teenagers to learn?

7. Are there gender differences in the effects of alcohol on the brain? Support your answer with specific information.

8. Why did the researchers do brain scans on a control group of teens who were not binge drinkers?

9. What evidence did scientists find that indicates that binge drinking damages the brains of teenagers?

10. The author of the article used the title “**Teen Binge Drinking Causes Irreversible Brain Damage**.” Is this an accurate title for the article? Explain why or why not.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Label on Dropper	Contents of Tube
<i>Blood Plasma after 2 drinks</i>	Buffer pH 3
<i>Blood Plasma after 4 drinks</i>	Buffer pH 7
<i>Blood Plasma after 6 drinks</i>	Buffer pH 10

Distributor: Microessential Laboratory Inc. PO Box 10824, 4224 Avenue H, Brooklyn, NY 11210

Telephone number for information: (718)338-3618 Medical emergency phone number (Chemtrec): (800) 424-9300

Date of this MSDS: 11/5/12

2. COMPOSITION/INFORMATION ON INGREDIENTS

Product	Ingredients	CAS Numbers	% Weight/Volume (balance is water)
pH 3 buffer	Sulphamic acid	5329-14-16	0.10%
	Potassium biphthalate	877-24-7	0.35%
pH 7 buffer	Potassium phosphate monobasic	7778-77-0	0.15%
	Sodium phosphate dibasic	7558-79-4	0.30%
pH 9 buffer	Sodium carbonate	497-19-8	0.25%
	Sodium bicarbonate	144-55-8	0.15%

For all the ingredients OSHA PEL: TWA – none estab. STEL – none estab.
ACGIH TLV: TWA – none estab. STEL – none estab.
NIOSH REL: TWA – none estab. STEL – none estab.
NIOSH ILDH: none estab.

3. HAZARDS IDENTIFICATION – for all pH buffer products

EMERGENCY OVERVIEW

Do not ingest. Avoid skin and eye contact. Avoid exposure to vapor or mists.

Potential Health Effects EYES: May cause irritation. SKIN: May cause irritation. INHALATION: n/a
INGESTION: May cause gastrointestinal discomfort and mouth burns .

4. FIRST AID MEASURES – for all pH buffer products

EYES - Flush with water for at least 15 minutes, raising and lowering eyelids occasionally. Get medical attention if irritation persists.

SKIN - Thoroughly wash exposed area for at least 15 minutes. Remove contaminated clothing. Launder contaminated clothing before reuse. Get medical attention if irritation persists.

INGESTION - Do not induce vomiting. If swallowed, if conscious, give plenty of water immediately and call a physician or poison control center. Never give anything by mouth to an unconscious person.

5. FIRE FIGHTING MEASURES – for all pH buffer products

NFPA Rating: Health: 1 Fire: 0 Reactivity: 0

Extinguisher Media: Any means suitable for extinguishing surrounding fire

Special Firefighting Procedures: Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: No data available

6. SPILL OR LEAK PROCEDURES – for all pH buffer products

Ventilate area of spill. Clean-up personnel should wear proper protective equipment and clothing. Absorb material with suitable absorbent and containerize for disposal.

7. HANDLING AND STORAGE – for all pH buffer products

Store in a cool dry place. This Material is not considered hazardous. Handle using safe laboratory practices.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION – for all pH buffer products

Respiratory Protection: n/a

Ventilation: Local Exhaust: Preferred
Mechanical(General): Acceptable
Special: No
Other: No

Protective Gloves: Natural rubber, Neoprene, PVC or equivalent.

Eye Protection: Splash proof chemical safety goggles should be worn.

Other Protective Clothing or Equipment: Lab coat, apron, eye wash, safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES – for all pH buffer products

Melting Point: ~0°C

Boiling Point: ~100°C

Vapor Pressure: information not available

Vapor Density: information not available

Specific Gravity (H₂O=1): ~1

Percent Volatile by Volume: >99

Evaporation Rate: information not available

Solubility in Water: soluble

Appearance and Odor: Clear colorless liquid

10. STABILITY AND REACTIVITY – for all pH buffer products

Stability: Stable

Materials to Avoid: strong acids and bases

Hazardous Decomposition Products: none known

Hazardous Polymerization: will not occur

11. TOXICOLOGICAL INFORMATION

Ingredient	Toxicity (oral-rat) LD ₅₀
Sulphamic acid	3160 mg/kg
Potassium biphthalate	3200 mg/kg
Sodium phosphate dibasic	17 g/kg
Potassium phosphate monobasic	7100 mg/kg
Sodium carbonate	4090 mg/kg
Sodium bicarbonate	4220 mg.kg

Effects of Overexposure (for all pH buffers):

Acute: Essentially non-hazardous. Possible irritation of eyes/skin/stomach

Chronic: None known.

Conditions aggravated/Target organs: none known

Target Organs: Eyes, skin, and gastrointestinal tract.

Primary Route(s) of Entry: Ingestion or skin contact.

12. ECOLOGICAL INFORMATION – for all pH buffer products

No ecological data available

13. DISPOSAL CONSIDERATIONS – for all pH buffer products

Waste Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations.

Always contact a permitted waste disposer (TSD) to assure compliance.

14. TRANSPORTATION INFORMATION D.O.T. SHIPPING NAME: Not regulated

15. REGULATORY INFORMATION – for all pH buffer products

EPA regulations: RCRA Hazardous waste number (40 CFR 261.33) – not listed
RCRS Hazardous waste classification (40 CFR 261) – not classified
SARA Toxic Chemical (40 CFR 372.65) – not listed
SARA EHS (Extremely Hazardous Substance (40 CFR 355) – not listed

OSHA regulations: Air Contaminant (29 CFR 1910.1000) – not listed

16. ADDITIONAL INFORMATION

The information provided in this Material Safety Data Sheet represents data from the manufacturer and/or vendor and is accurate to the best of our knowledge. By providing this information, Science Take-Out LLC makes no guarantee or warranty, expressed or implied, concerning the safe use, storage, handling, precautions, and/or disposal of the products covered or the accuracy of the information contained in this fact sheet. It is the responsibility of the user to comply with local, state, and federal laws and regulations concerning the safe use, storage, handling, precautions, and/or disposal of products covered in this fact sheet.