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# Eye on Safety

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**National Institutes of Health  
Office of Research Services  
Division of Occupational  
Health and Safety**

Providing a safe and healthy environment for employees, patients and visitors.

*“Safe science and good science go hand-in-hand.”*

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## Compressed gases: Lightning in a bottle

Everyone can come up with an example of how compressed gases are used. Compressed propane grills our food. Compressed helium fills birthday balloons. Compressed gases are used as anesthetics for surgery and to provide oxygen to patients. Compressed gases are used in welding operations and to manufacture products. If compressed gas cylinders aren't handled, stored, or used properly, the results can be catastrophic.

OSHA's hazard communication standard (including its training requirements) applies to compressed gases. Safety data sheets (SDSs) are a useful source of information on a compressed gas product's hazards and procedures for safe handling, storage, and use. The pamphlets published by the Compressed Gas Association (CGA) contain detailed information on compressed gases. Under 29 CFR 1910.101(b), OSHA incorporates by reference the CGA Pamphlet P-1-1965, Safe Handling of Compressed Gases. This consensus standard also requires training for workers who handle compressed gas containers.

### What are compressed gases?

In the natural state, gases mix and spread out to fill the area. To harness the properties of an individual gas, industrial processes are used to compress and confine gases to

containers. When compressed, the gas exerts increased pressure inside of the container because the confined molecules cannot expand.

### Gas cylinders and tanks

Cylinders and tanks are used to store and transport compressed gases. They're made of thick, strong materials to withstand the high pressure exerted by the gas. The opening of the cylinder or tank is sealed by a



specially designed valve. Typically, pressure gauges are used to show how much pressure (and how much gas) remains in the cylinder or tank. The gas is usually released through a specially designed regulator so that the amount of gas flow from the container can be controlled.

Compressed gases are hazardous simply because they are stored under pressure. One dramatic example of the hazards is "rocketing." This occurs when a cylinder's valve assembly accidentally breaks off or the cylinder is otherwise ruptured. The sudden release of pressure is enough to drive the cylinder like a missile — it can blast its way through a wall.

Compressed gases have other characteristics that add to the hazards.

**Flammable gases** catch fire easily and burn quickly. Acetylene, propane, and natural gas are some examples.

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# Compressed gases: Lightning in a bottle *(continued from page 1)*

**Inert gases**, such as nitrogen or helium, displace oxygen for breathing and can lead to suffocation (asphyxiation) if the gas builds up in a confined area with poor ventilation.

**Oxidizing gases** (oxygen is the best example) can cause explosions or fires if they react with organic and combustible materials. It is important that containers of oxidizing gases and associated equipment be free of oil and grease. In addition, clothing and other materials that have been exposed to an oxygen-rich atmosphere are fire hazards until the oxygen dissipates.

**Corrosive gases**, such as anhydrous ammonia, cause burns to exposed eyes, skin, and the respiratory tract. Employees need to wear special personal protective equipment (PPE) that could include a supplied-air respirator when handling these gases. Eyewashes and emergency showers must be available.

**Poison (toxic) gases** can include arsine, methyl bromide, phosgene, and phosphine. They can only be handled by specially trained personnel.

## Use PPE as needed

Just because a compressed gas appears to be contained in a cylinder doesn't mean that you won't need to wear



PPE. Fortunately, PPE can protect you from overexposures to compressed gases. The PPE you need depends on the hazards of the job.

Some types of PPE that may be needed when handling compressed gases could include eye protection, face shields, respirators, hand protection, safety shoes, and chemical protective clothing.

## Handling and use of compressed gas cylinders

Compressed gas equipment has unique inspection, handling, and storage procedures:

- Do not accept deliveries of damaged cylinders or compressed gas equipment.
- Always check the container's label to identify a compressed gas — do not depend on the color of the cylinder to indicate the contents. Read the SDS for more information. If you don't know what's in a cylinder, don't use it.
- Use properly equipped carts or other material handling equipment to move cylinders. Cylinders should not be dropped or slid. Do not lift a cylinder by its valve.
- Match regulators, valves, hoses, and other equipment to the specific type of gas in the container. Never try to force a connection between a cylinder and a regulator or other equipment. Use the wrench provided by the gas supplier.
- Inspect cylinders for dents, rust, or other damage. Threads on valves, regulators, and other equipment should be inspected for damage, dirt, or grease.
- Remove damaged equipment from service immediately.
- Open container valves slowly with valve outlets pointed away from you and others. Pressure gauges on regulators show the pressure inside of the container and the pressure being delivered to the line or tool. Regulators reduce the high gas pressure inside the cylinder to the lower working pressure. Use the adjusting screw on the regulator to set the correct working pressure for the job. Never hammer open or closed.
- Always replace the cylinder's valve cover when the cylinder is not in use.

## Storage of compressed gas cylinders

As a general rule, store each hazard class separately. Storage areas must be posted with the hazard class or the names of the gases being stored. Full and empty cylinders should be segregated. The storage area should be dry and well ventilated — away from excessive heat or open flames. And, "No Smoking" signs must be posted where appropriate.



Cylinders must be stored so that they are secure and upright. Make sure the cylinder's valve cover is installed.

Oxygen cylinders must be stored at least 20 feet away from flammable gas containers and combustible materials, or the equipment must be separated by a noncombustible barrier (five feet high and a fire resistance rating of one-half hour).

Follow your facility's emergency response procedures if a compressed gas cylinder or tank is leaking. Immediately report an emergency release to the appropriate persons and evacuate people to a safe area.

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## Safety focus: Getting adequate rest

A good night's sleep is more than a luxury. Sleep is as important to survival as food and water, but not everyone gets the sleep they need. Polls show 40 percent of all American adults sleep less than 7 hours on weekdays. Fatigue not only can reduce your quality of life and productivity, but also can result in injury, illness, or death.



How much sleep do you need? You should aim for 7 to 9 hours of sleep each day. Getting adequate rest allows our bodies and minds to refuel. There are only so many hours in a day. If you engage in activities that don't allow you to get the rest you need, you end up tired during the day and not able to enjoy activities or be as productive in your work. An estimated three million people work the night shift in the United States. For those individuals, adequate sleep may be harder to achieve. Shift work forces you to try to sleep when activities around you - and your own "biological rhythms" - signal you to be awake. One study shows that shift workers are two to five times more likely than employees with regular, daytime hours to fall asleep on the job. Working a rotating shift puts you at greater risk because of the frequent change to sleep patterns.

### Getting adequate rest

There are some common sense tips that you can follow to be sure that you get the rest you need.

1. Start with a good sleep environment.  
First, look at your bedroom to determine what could be robbing you of sleep. Is your mattress and pillow comfortable or are you moving to the family room recliner at night because of discomfort? Are there noises, bright lights, or warm temperatures preventing you from sleeping? Try to eliminate these things if possible. A quiet, dark environment is best for sleeping. A room temperature that is too warm or too cold can also make it hard to sleep. Does your sleep partner have a different sleep pattern than you? If he or she snores, can't fall or stay asleep, or gets up frequently during the night, your sleep can be disrupted. Is there a television or computer in the bedroom? Electronic devices can be a distraction and deprive you of needed sleep. Does Fido sleep in bed with you? You may need to move him elsewhere.
2. Maintain good sleep-related habits.  
Do you try and go to bed at the same time each day? Sticking to a sleep schedule can help your body cycle into and out of sleep patterns more readily. Go to bed and wake up at the same time each day, even on

weekends. Are you a napper? If so, try to avoid taking naps after 3 p.m. Naps can boost your brain power, but late afternoon naps can make it harder to fall asleep at night. Keeping naps shorter than an hour can also help you avoid feeling sluggish.

#### 3. Relax before bed.

Incorporate a relaxing activity, such as reading, listening to music, or taking a warm bath into your bedtime routine. These activities can help you relax so you're ready to sleep.

#### 4. Avoid sleep disrupters.

- a. Avoid caffeine and nicotine in the evening. Coffee, colas, teas, and chocolate contain caffeine and can take eight hours to wear off fully. Substitute with caffeine-free varieties in the evening. Nicotine is also a stimulant so avoid tobacco use.
- b. Consuming alcohol before bed can make you feel sedated, but it tends to keep you in the lighter stages of sleep. This can cause you to wake up in the middle of the night when the sedating effects have worn off.
- c. Large meals at night can cause indigestion, interfering with sleep. Drinking many fluids at night can cause you to wake up to urinate. Limit meal size and beverage intake.
- d. Certain medicines can delay or disrupt your sleep. Some commonly prescribed heart, blood pressure, or asthma medications, as well as some over-the-counter and herbal remedies for colds or allergies, can disrupt sleep patterns. Ask your doctor about options that will not disrupt your sleep.
- e. Avoid exercising right before bed. Try to exercise at least 30 minutes on most days, but try to finish several hours before your bedtime.

### When should I talk to my doctor?

Inability to sleep could be due to a sleep disorder. Talk to your doctor if you have any of these symptoms:

- Snoring;
- Breathing pauses during sleep;
- Problems sleeping at night;
- Difficulty staying awake during the day; and
- An unexplained decrease in daytime performance.

You may not feel sleepy, but inadequate sleep can negatively affect your waking-hours performance, your thinking, and your mood.

NIH, OD, ORS, DOHS  
Bldg 13, Room 3K04  
13 South Drive, MSC 5760  
Bethesda, MD 20892-5760  
Phone: (301) 496-2960  
Fax: (301) 402-0313

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## How many calories are in your Thanksgiving dinner?

*"Gratitude turns what we have into enough."*

*~ Author Unknown*



**Resist the temptation to overindulge at holiday gatherings.**

Did you know that the traditional Thanksgiving meal can contain as many calories as what you might consume in an entire day? Most of the basic foods are pretty nutritious. It's those delicious extras that can pile on calories. Here are calorie counts in some of your favorite Thanksgiving dishes.

### #1: The Turkey

Turkey alone is very lean with low fat, but who doesn't want gravy (pure fat) and cranberries on top? **The numbers:** 4 oz. of white meat is 158 calories; 4 oz. of dark meat 183 calories. Add about 25 more calories if you eat the skin too. The meat has less than 2 grams of fat.

### #2: The Stuffing (Grandma's)

Of course, everyone has their favorite recipe, but grandma's is the best. This dish has the most sodium of any of the favorites. **The numbers:** 165 calories, 4 grams of fat, 515 milligrams of sodium.

### #3: The Sweet Potatoes

Ah, nutritious sweet potatoes, but who wants them on Thanksgiving unless they are mixed with butter and brown sugar and topped with marshmallows? **The numbers:** 305 calories, 4 grams of fat.

### #4: The Mashed Potatoes

Yes, that's right. We need two kinds of potatoes. Nice fluffy potatoes loaded with gravy. **The numbers:** 185 calories, 3 grams of fat (minus the gravy).

### #5: The Gravy

Can you eat mashed potatoes and stuffing without gravy on top? **The numbers:** 100 calories, 4 grams of fat.

### #6: The Biscuits

Can you eat just one biscuit? These are hard to resist and very useful for soaking up any excess gravy. **The numbers:** 212 calories, 10 grams of fat (without the butter on top).

### #7: The Green Bean Casserole

This is a Thanksgiving staple in many households. Green beans are healthy too, except for those delicious onion rings on top. **The numbers:** 366 calories, 2.1 grams of fat.

### #8: The Pie

When you think of Thanksgiving dessert, you think of pie. Whether it is pumpkin, apple, or mincemeat, a nice big slice slathered with whipped cream is hard to turn down. **The numbers:** 310 calories, 20 grams of fat.

### #9: The Drinks

Whether it is wine, beer, a cocktail, sparkling cider, eggnog, or a few sodas, the calories add up. **The numbers:** 120 calories or more.

If you add it all up, you can consume about 2000 calories at Thanksgiving dinner if you have one helping of everything or 3500 or more calories if you have more helpings. Think moderation, but if you can't, better wear the pants with the elastic waist.