

# Tobacco Education Experiments and Activities

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These activities and experiments have been used extensively in classrooms throughout Trumbull County, Ohio.

They have been compiled from many sources by the Trumbull County Health Department's Health Education Department.

The purpose is to demonstrate the effects of the poisons in tobacco, focusing primarily on nicotine, tar, and carbon monoxide.

Our philosophy is:

**“What I hear, I forget. What I see, I remember. What I do, I learn.”  
Chinese Proverb**

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Reprinted with permission by the Trumbull County Health Department as a supplement to the 2002-03 AAFP Tar Wars Program Curriculum.

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# Nicotine

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Nicotine is a poisonous, water-soluble alkaloid found in tobacco leaves and used as an insecticide. One cigarette contains approximately 8 milligrams of nicotine. Nicotine increases heart rate, and blood pressure rises when the blood vessels constrict. Nicotine affects the body in only three-and-a-half seconds, and the effect lasts approximately 90 minutes.

## Simulated Blood Vessel Restriction/Heart Rate Increases

**Purpose** – To simulate the effect of nicotine on the blood vessels.

### Equipment

- Small C-clamp
- Bicycle pump

### Procedure

One child pumps the bicycle pump. Another child tightens the C-clamp on the pump hose. As the clamp tightens, it will get harder to pump. A third child continually tells the first child to “pump faster.”

### Key Points

Nicotine makes the heart beat faster and blood vessels smaller, which causes blood pressure to rise.

## Simulated Blood Vessel Restriction

**Purpose** – To simulate the effect of nicotine on the blood vessels.

### Equipment

- 6 or more plastic or styrofoam cups
- 3 or more large diameter straws
- 3 or more very small diameter straws (such as plastic coffee stirrers)
- Water
- Stopwatch

### Procedure

- Fill all six glasses with equal amounts of water. Put the large diameter straws in three of the glasses. Put three very small diameter straws in the other three glasses.
- On the word “GO,” have six children begin to drink as fast as they can (as if it were a race).
- Time them using the stopwatch.

### Key Points

- It should take twice as long to drink the water using small straws.
- Nicotine constricts the blood vessels which, in turn, decreases the blood flow and makes the heart have to work harder.

## Nicotine is a Poison

**Purpose** – To graphically show that the nicotine used in cigarettes is a deadly poison.

### Equipment

- 1 pack of cigarettes
- Hypodermic needle

### Procedure

Hold up the pack of cigarettes so that all students can see it. Insert the needle into the pack. Draw back the plunger and say, “If I could get all the nicotine out of this pack of cigarettes...” – at this point pull the needle out and finish the sentence – “and put it in your arm, you would die!”

### Key Points

A person smokes just one cigarette at a time – not a whole pack – so they are receiving nonlethal doses of poison. Fact: no one would knowingly take a nonlethal dose of any other poison on a regular basis.

## **Tobacco – Tar**

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Tar is a sticky substance found on tobacco leaves. Tar coats the lungs and air sacs in smokers, preventing them from getting enough oxygen. Tar paralyzes the cilia in a smoker's windpipe so that dust particles and pollen are not swept out of the air passages.

Tar contains more than 40 cancer-causing chemicals. Organs affected by these poisons include not only the mouth, vocal chords, throat, and lungs, but also the kidneys, bladder, and uterus and ovaries (in women).

### **Tar Accumulation**

**Purpose** – To demonstrate the amount of tar that can accumulate from one or more cigarettes.

#### **Equipment**

- Filterless cigarettes and matches
- Cotton balls
- "Smoking Machine"
  - a. Turkey baster or empty ketchup bottle
  - b. Large syringe

#### **Procedure**

- Stuff cotton balls into the end of the smoking machine.
- Tape an unfiltered cigarette onto the end of the smoking machine.
- Light the cigarette and draw the smoke back through the cotton balls by pulling back on the syringe or by squeezing the bottle or baster.
- Examine the tar accumulation by looking, smelling, and touching.

#### **Key Points**

- Not all of the tar was caught.
- Smell the inside of the smoking machine to see what a smoker's breath smells like.
- The accumulation was from only one or two cigarettes. Imagine what the tar accumulation would be from a whole pack of cigarettes.

### **Tar Accumulation Over a One-Year Period**

**Purpose** – To show how much tar accumulates in a smoker's lungs over a period of one year.

#### **Equipment**

- A clear half-pint jar
- 8 ounces of black strap molasses

#### **Procedure**

Put the molasses in the half-pint jar and use as a display model.

#### **Key Points**

Eight ounces of tar can accumulate in the lungs of a person who smokes one pack of cigarettes per day for one year.

### **Tar's Paralyzing Effects on Bronchial Cilia**

**Purpose** – To graphically show how tar affects bronchial cilia.

#### **Equipment**

- Balls of various sizes

#### **Procedure**

- Have children form two rows facing each other, gauntlet-style, with hands stretched out and barely touching each others' finger tips. Fingers should be wiggling gently and slowly like cilia.

- One end of the gauntlet represents the lungs; the other end represents the mouth.
- The teacher places a ball in the hands of children at the “lungs” end of the gauntlet. The ball is slowly passed through the “mouth.”
- Do the procedure while saying that the balls represent dust, dirt, pollen, and airborne particles that healthy cilia are able to carry out of the airways.
- Then tell children that the cilia have been exposed to tobacco smoke and are now paralyzed and covered with sticky tobacco tar.
- The teacher again places the balls in the hands of the children at the “lungs” end of the gauntlet, but the balls stay there because the cilia are paralyzed and sticky.

### **Key Points**

- Children who are around smokers have a higher rate of respiratory problems because dust and allergic particles stay in the lungs due to cilia paralyzed by tar accumulation.
- Adult smokers must cough forcefully to get the dust and dirt out of their lungs.

## **Obstructive Properties of Tar**

**Purpose** – To demonstrate how an accumulation of tar can inhibit the absorption of oxygen.

### **Equipment**

- 2 coffee filters
- Water
- Funnel
- Beaker or jar
- Black strap molasses or other tar-like substance

### **Procedure**

- Place the funnel in the jar. Line the funnel with filter paper, and pour in the water. Note how quickly it flows through. Remove the wet paper.
- Coat another piece of filter paper with molasses or other tar-like substance and place it in the funnel. Pour water into the filter, noting how slowly the water flows through the coated paper.

### **Key Points**

- The filter paper represents lung tissue.
- The water represents oxygen.
- The molasses represents tobacco tar.
- The lungs coated with tar do not exchange oxygen as well as healthy lungs without tar.

## **Effects of Tar on Plants**

**Purpose** – To demonstrate the harmful effects of tar.

### **Equipment**

- Smoking machine described in **Tar Accumulation** activity
- 5 – 6 cigarettes and matches
- Cotton balls
- Several plants
- Latex gloves

### **Procedure**

- Using the smoking machine, collect the tar accumulated from four to five cigarettes.
- Wearing latex gloves, wipe the tar on the leaves and stems of several plants. Put a few plants aside to act as controls.
- Record changes taking place with plants over a period of time.

### **Key Points**

- What happened to the plants?
- What parts of the human body would tar touch?
- What are some diseases humans could get from tar?

## **Carbon Monoxide and Other Poisons**

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Carbon monoxide (CO) is an odorless, colorless gas that reduces oxygen levels in the blood. CO lessens night vision and hearing and is the same deadly gas found in auto exhaust.

Tobacco smoke is full of dozens of other poisons, such as arsenic, barium, lithium, copper, lead and xanthine.

### **Oxygen/Carbon Monoxide Simulation**

**Purpose** – To provide an analogy of how CO mixes easier in the bloodstream than oxygen.

#### **Equipment**

- About ½ tsp. of coffee grounds
- Food coloring (blue or green is best)
- Eye dropper or small straw to pipette a drop of food coloring
- Small, clear bottle with lid, 2/3 full of water

#### **Procedure**

- Place the coffee grounds in the bottle of water and shake it up. The coffee colors the water very slowly. This represents oxygen in the blood.
- Now add one drop of food coloring to the same bottle. Note how quickly it colors the water. This represents CO as it enters the blood.

#### **Key Points**

CO is picked up in the blood 240 times faster than oxygen. The oxygen level drops when carbon monoxide is present.

### **Poisons in Tobacco Smoke**

**Purpose** – To show the effects of tobacco smoke on a living object.

#### **Equipment**

- 2 small potted plants of the same variety (marigolds work well)
- Aquarium with some type of lid
- 6 – 8 cigarettes
- Ashtray

#### **Procedure**

- Place one plant and the ashtray in the aquarium. Keep the other plant out of the aquarium for control comparison.
- Light a cigarette and set it on the ashtray inside the aquarium. Cover the aquarium to prevent the smoke from escaping. Leave the lid on the aquarium until the smoke dissipates, approximately 30 minutes.
- Have the plant “smoke” twice a day for a duration of three to four days.
- After one week, compare the smoking plant to the nonsmoking plant.

#### **Key Points**

- The smoking plant will look shriveled and sickly compared to the nonsmoking control plant.

## Lung Capacity

**Purpose** – To demonstrate and discuss the effects of cigarette smoke on lung capacity.

### Equipment

- 2-liter or 1-gallon jug filled with water
- Basin 2/3 full of water
- A bendable straw

### Procedure

- Hold your thumb over the end of the 2-liter bottle and turn it upside down in the basin. Pressure will keep the water in the bottle.
- Insert the short end of the bendable straw into the end of the bottle.
- Ask a child to take a very deep breath and blow into the straw, emptying their lungs into the bottle. The child blows just one long breath.
- Remove the straw, place your thumb over the end of the bottle, and turn it right-side up.

### Key Points

- The amount of air in the bottle is the amount the child had in their lungs.
- Smoking and environmental tobacco smoke reduces lung capacity.

## Smokeless Tobacco

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Chewing tobacco (Red Man and Levi Garrett) and snuff (Skoal, Red Seal, and Copenhagen) are not safe alternatives to smoking. A can of snuff has three times the nicotine as a pack of cigarettes.

Smokeless tobacco causes heart disease and mouth and throat cancers. It stains the teeth and destroys the gums.

## Tobacco Juice

**Purpose** – To show how tobacco juice stains the entire mouth.

### Equipment

- Clear glass jar with a lid
- Water
- Chewing tobacco such as Red Man or Levi Garrett

### Procedure

- Fill the jar half full with water.
- Place a wad of tobacco the size of a golf ball in the jar.
- Pass the jar around the room, allowing the children to shake it.

### Key Points

- Tobacco juice is not only full of nicotine and cancer-causing poisons but also stains the teeth and destroys the lips and gums.

## Tobacco Juice Stains

**Purpose** – To demonstrate how tobacco juice stains the teeth.

### Equipment

- 1 hard-boiled egg (preferably with a few cracks in it)
- Enough tobacco juice to cover the egg
- Toothbrush
- Toothpaste
- Latex gloves

**Procedure**

- Soak the egg in tobacco juice in a refrigerator for two days.
- Wearing latex gloves, remove the egg and observe how stained it is.
- With the toothbrush and toothpaste, brush the egg as if it were a tooth with eight or 10 strokes. Note that brushing is not able to remove all of the stain, especially in the cracks.

**Key Points**

- Over time, tobacco juice badly stains teeth.
- Tobacco juice causes gums to recede and damages lips.
- Tobacco use also causes bad breath.